

Section 16721: Fire Alarm and Detection Systems

Integrated Life Safety System

PART 1 General

1.1 Summary

1.1.1 General

Drawings and conditions of the contract, including but not limited to General Conditions, and the Special Conditions listed below, apply to work of this section.

Supplementary Instructions to Bidders.

Supplementary Conditions.

Summary of the Work.

Project Coordination.

Cutting and Patching.

Definitions and Standards.

Submittals.

Schedules and Reports.

Temporary Facilities.

Security Regulations.

Safety and Health.

Products.

Project Closeout.

PROJECT/WORK IDENTIFICATION

Project Name and Location: <INSERT PROJECT NAME & LOCATION>

Architect: <INSERT ARCHITECT NAME>

Owners Representative for this project is: <INSERT OWNER'S REP>

Contract documents indicate the work of contract, and related requirements and conditions that have an impact on the project. Related requirements and conditions that are indicated on the contract documents include, but are not necessarily limited to, the following:

Existing site conditions and restrictions.

Other work prior to work of contract.

Alterations and coordination with existing work.

Other work to be performed concurrently by Owner.

Other work to be performed concurrently by separate contractors.

Other work subsequent to work of Contract.

Requirements for occupancy by Owner prior to completion of work of contract.

1.1.2 Summary - Fire

This performance specification provides the minimum requirements for the Life Safety System. The system shall include, but not limited to all equipment,

materials, labor, documentation and services necessary to furnish and install a complete, operational system to include but not limited to the following functions:

Smoke and fire detection.
Sprinkler suppression system monitoring and control.
Off-premise notification.
Smoke control.
Releasing Service
One-way voice communication notification system.
Two-way voice communication system.

1.1.3 Summary - Fire - Security - Access Control

This performance specification provides the minimum requirements for the Integrated Life Safety, Security, Access and Video Surveillance System. The system shall include, but not limited to all equipment, materials, labor, documentation and services necessary to furnish and install a complete, operational system to include but not limited to the following functions:

Fire detection and alarm system
Access control system
Security system
Video surveillance interface

1.1.4 Project Representatives

All contacts with the < > Building
shall be directed to the Owner's Representative, hereafter referred to as the
Owner: <Insert Name>

1.1.5 Interpretation

No interpretations of the meaning of the bid documents will be made to any bidder orally. Each request for such interpretation shall be made to the engineer in writing, addressed to: <INSERT NAME & ADDRESS>

Written requests for interpretation will be received until <INSERT DATE>. The Engineer will issue interpretations and supplemental instructions to all bidders in written form by <INSERT DATE >.

1.1.6 Manufacturer

Acceptable fire alarm system manufacturers include:
Edwards Systems Technology, Inc.

All equipment and components shall be the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling (fire alarm) system <access control> <security>, and smoke control system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

The contractor shall provide, from the acceptable manufacturer's current product lines, equipment and components, which comply, with the requirements of these specifications. Equipment or components, which do not provide the performance and features, required by these specifications are not acceptable, regardless of manufacturer.

1.1.7 Alternates - Fire

Strict conformance to this specification is required to ensure that the installed and programmed system will function as designed, and will accommodate the future requirements and operations of the building owner. All specified operational features must be met without exception.

The authorized representative of the manufacturer of the major equipment shall be responsible for the satisfactory installation of the complete system.

All equipment and components shall be the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling system, access control, and smoke control. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

All control panel assemblies and connected field appliances shall be provided by the same system supplier, and shall be designed and tested to ensure that the system operates as specified. The system shall utilize independently addressed, microprocessor-based smoke detectors, heat detectors, as described in this specification.

All equipment and components shall be installed in strict compliance with the manufacturer's recommendations.

The equipment to be supplied will be considered only if it meets all sections of the performance specification. Any deviations of system performance outlined in this specification will only be considered when the following requirements have

been met:

A complete description of proposed alternate system performance methods with three (3) copies of working drawings thereof for approval by the Owner, not less than ten (10) calendar days prior to the scheduled date for submission of bids.

The supplier shall furnish evidence that the proposed or alternate system performance is equal or superior to the system operation stated in the specification. Such evidence shall be submitted to and accepted by the Owner, not less than ten (10) calendar days prior to the scheduled date for submission of bids.

The supplier shall submit a point-by-point statement of compliance for all sections in this specification. The statement of compliance shall consist of a list of all paragraphs within these sections. Where the proposed system complies fully with the paragraph as written, placing the word "comply" opposite the paragraph number shall indicate such. Where the proposed system does not comply with the paragraph as written, and the supplier feels the proposed system will accomplish the intent of the paragraph, a full description of the function as well as a full narrative description of how its proposal will meet its intent shall be provided. Any submission that does not include a point by point statement of compliance as described herein shall be disqualified. Where a full description is not provided, it shall be assumed that the proposed system does not comply.

The acceptability of any alternate proposed system shall be the sole decision of the Owner or his authorized representative.

1.1.8 Alternates - Fire - Security - Access Control

Strict conformance to this specification is required to ensure that the installed and programmed system will function as designed, and will accommodate the future requirements and operations of the building owner. All specified operational features must be met without exception.

The authorized representative of the manufacturer of the major equipment shall be responsible for the satisfactory installation of the complete system.

All equipment and components shall be the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling system, access control, and smoke control. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

All control panel assemblies and connected field appliances shall be provided by the same system supplier, and shall be designed and tested to ensure that the system operates as specified. The system shall utilize independently addressed, microprocessor-based smoke detectors, heat detectors, intrusion detection sensors, modules, and card reader controllers as described in this specification.

All equipment and components shall be installed in strict compliance with the manufacturer's recommendations.

The equipment to be supplied will be considered only if it meets all sections of the performance specification. Any deviations of system performance outlined in this specification will only be considered when the following requirements have been met:

A complete description of proposed alternate system performance methods with three (3) copies of working drawings thereof for approval by the Owner, not less than ten (10) calendar days prior to the scheduled date for submission of bids.

The supplier shall furnish evidence that the proposed or alternate system performance is equal or superior to the system operation stated in the specification. Such evidence shall be submitted to and accepted by the Owner, not less than ten (10) calendar days prior to the scheduled date for submission of bids.

The supplier shall submit a point-by-point statement of compliance for all sections in this specification. The statement of compliance shall consist of a list of all paragraphs within these sections. Where the proposed system complies fully with the paragraph as written, placing the word "comply" opposite the paragraph number shall indicate such. Where the proposed system does not comply with the paragraph as written, and the supplier feels the proposed system will accomplish the intent of the paragraph, a full description of the function as well as a full narrative description of how its proposal will meet its intent shall be provided. Any submission that does not include a point by point statement of compliance as described herein shall be disqualified. Where a full description is not provided, it shall be assumed that the proposed system does not comply.

The acceptability of any alternate proposed system shall be the sole decision of the Owner or his authorized representative.

1.2 References

1.2.1 General

1.2.1.1 Definitions and Abbreviations

ADA: Americans with Disabilities Act.
AFF: Above Finished Floor.
AHJ: Authority Having Jurisdiction.
Approved: Unless otherwise stated, materials, equipment or submittals approved by the Authority or AHJ.
Circuit: Wire path from a group of devices or appliances to a control panel or transponder.
CPU: The central computer of a multiplex fire alarm or voice command control system.
CRC: Card Reader Controller
CRT: Cathode Ray Tube.
FACP: Fire Alarm Control Panel.
FCC: Fire Command Center.
FSCP: Firefighter's Smoke Control Panel

HVAC: Heating Ventilating and Air Conditioning.
IDC: Initiating Device Circuit.
LED: Light Emitting Diode.
LCD: Liquid Crystal Display.
NFPA: National Fire Protection Association.
NAC: Notification Appliance Circuit.
NCP: Local Network Control Panel.
PTR: Printer.
RCP Remote Control Panel
SLC: Signaling Line Circuit.
Style 1: As defined by NFPA 72, Class B.
Style 4: As defined by NFPA 72, Class B.
Style 6: As defined by NFPA 72, Class A.
Style 7: As defined by NFPA 72, Class A.
Style B: As defined in NFPA 72, Class B.
Style D: As defined in NFPA 72, Class A.
Style Y: As defined in NFPA 72, Class B.
UL or ULI: Underwriters Laboratories, Inc.
UL Listed: Materials or equipment listed and included in the most recent edition of the UL Fire Protection Equipment Directory.
Zone: Combination of one or more circuits or devices in a defined building area, i.e. 3 speaker circuits on a floor combined to form a single zone.

1.2.1.2 Codes -- General

All work and materials shall conform to all applicable Federal, State and local codes and regulations governing the installation. If there is a conflict

between the referenced standards, federal, state or local codes, and this specification, it is the bidder's responsibility to immediately bring the conflict to the attention of the Engineer for resolution. National standards shall prevail unless local codes are more stringent. The bidder shall not attempt to resolve conflicts directly with the local authorities unless specifically authorized by the Engineer.

System components proposed in this specification shall be ULI listed to operate together as a system. The supplier shall provide evidence, with his submittal, of listings of all proposed equipment and combinations of equipment. The supplier shall be responsible for filing of all documents, paying all fees (including, but not limited to plan checking and permit) and securing all permits, inspections and approvals. Upon receipt of approved drawings from the authority having jurisdiction, the supplier shall immediately forward two sets of drawings to the Owner. These drawings shall either be stamped approved or a copy of the letter stating approval shall be included.

1.2.2 Codes

1.2.2.1 Codes - Fire

The equipment and installation shall comply with the current provisions of the following codes and standards:

NFPA 70 - 2002 National Electric Code®
NFPA 72 - 1999 National Fire Alarm Code®
NFPA 90A - 1999 Air Conditioning Systems
NFPA 92A - 2000 Smoke Control Systems
NFPA 92B - 2000 Smoke Management Systems in Malls, Atria, and Large Areas
NFPA 101- 2000 Life Safety Code®
UL 864 - Control Units for Fire Protective Signaling Systems.

UL 268 - Smoke Detectors for Fire Protective Signaling Systems.
UL 268A - Smoke Detectors for Duct Applications.
UL 217 - Single and Multiple Station Smoke Alarms
UL 521 - Heat Detectors for Fire Protective Signaling Systems.
UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.
UL 464 - Audible Signaling Appliances.
UL 38 - Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems
UL 346 - Waterflow Indicators for Fire Protective Signaling Systems.
UL 1971 - Signaling Devices for the Hearing-Impaired.

UL 1481 - Power Supplies for Fire Protective Signaling Systems.
UL 1711 - Amplifiers for Fire Protective Signaling Systems.
UL 1635 - Digital Alarm Communicator System Units

<insert AHJ>

<Local codes/standards such as: CSFM (State of California) , MEA (New York City), City of Chicago >

<insert state Accessibility Code, if applicable>

Federal Codes and Regulations

Americans with Disabilities Act (ADA)

Factory Mutual (FM) approval

International Standards Organization (ISO)
ISO-9000
ISO-9001

European Union (EU)
EMC Directive 89/336/EEC

Electromagnetic Compatibility Requirements

CENELL - Appropriate European Committee for Electro-Technology
Standardization Standards.

1.3 System Description

1.3.1 General

1.3.1.1 General - Fire

The Contractor shall furnish all labor, services and materials necessary to furnish and install a complete, functional fire alarm system (System). The System shall comply in respects with all pertinent codes, rules, regulations and laws of the Authority, and local jurisdiction. The System shall comply in all respects with the requirements of the specifications, manufacturer's recommendations and Underwriters Laboratories Inc. (ULI) listings.

It is further intended that upon completion of this work, the Owner be provided with:

Complete information and drawings describing and depicting the entire system(s) as installed, including all information necessary for maintaining, troubleshooting, and/or expanding the system(s) at a future date.

Complete documentation of system(s) testing.

Certification that the entire system(s) has/have been inspected and tested, is/are installed entirely in accordance with the applicable codes, standards, manufacturer's recommendations and ULI listings, and is/are in proper working order. Contractor shall use "Fire Alarm System Certification and Description" as required by Section 1-6.2 of NFPA 72 - 1999 edition.

1.3.2 Description

1.3.2.1 Description - Fire

<Note: The following section needs to be specifically tailored to the specific project. The intent of this section is to describe the project scope, describe location of equipment and any additional details.>

Provide and install a new fire detection and alarm system consisting of:

Fire command center shall be located as shown on the drawings.

LCD annunciator shall be located as shown on the drawings.

Provide a multi-channel one-way voice communication system.

Provide a color graphic workstation and printer, as shown on the drawings.

Remote control panel(s) shall be located every five (5) floors, as shown on the drawings..

Manual pull stations shall be located as shown on the drawings.

Area smoke detection shall be provided as shown on drawings.

Area heat detection shall be provided as shown on drawings.

Beam smoke detection shall be located as shown on the drawings

Duct smoke detection shall be provided as shown on the drawings.

Monitor the sprinkler system waterflow(s) and valve supervisory switch(s).

Monitor the stand alone suppression systems as shown on the drawings.

Provide audible appliances located throughout the building, as shown on the drawings.

Provide synchronized visual appliances located throughout the building, as shown on the drawings.

Provide a two-way communication system with <remote telephone> <phone jack> located at elevator lobby(s), within exit stairwell(s), elevator car(s), the fire pump room, as shown on drawings.

Provide magnetic door holders, as shown on drawings.

Provide fan shutdown controls as shown on drawings.

Provide direct interface to the building automation system.

Provide elevator recall functions for primary and alternate floors and elevator power shunt trip activation.

Provide connection to a Central Station. The owner shall arrange for two dedicated phone lines to be terminated as directed by the installing contractor.

<Remove the existing fire detection and alarm system(s).>

1.3.3 Operations

1.3.3.1 Sequence of Operations

1.3.3.1.1 General

<The following representative tasks should be customized for each project>

Upon the alarm activation of any area smoke detector, heat detector, manual pull station, sprinkler waterflow, the following functions shall automatically occur:

The internal audible device shall sound at the control panel or command center.

Display the alarm event on the graphical workstation.

The LCD display shall indicate all applicable information associated with the alarm condition including; zone, device type, device location and time/date.

All system activity/events shall be documented on the system printer.

Any remote or local annunciator LCD/LED's associated with the alarm zone shall be illuminated.

Activate notification audible appliances on the fire floors (zones) immediately above and below (adjacent to) the fire floor (zone) <general alarm evacuation>.

Activate visual strobes notification appliances on the fire floors (zones) immediately above and below (adjacent to) the fire floor (zone) <general alarm evacuation>. The visual strobe shall continue to flash until the system has been reset. The visual strobe shall not stop operating when the "Alarm Silence" is pressed.

Transmit signal to the building automation system.

Transmit signal to the central station with point identification.

Activate automatic smoke control sequences.

All automatic events programmed to the alarm point shall be executed and the associated outputs activated.

All stairwell/exit doors shall unlock throughout the building.

All self-closing fire/smoke doors held open shall be released.

Direct the closed circuit TV cameras to the alarm event and start video recording.

Transmit alarm text messages to "alpha-numerical" display pagers.

1.3.3.1.2 General - Audio

<The following representative tasks should be customized for each project>

Upon alarm activation of any area smoke detector, heat detector, manual pull station, sprinkler waterflow, the following functions shall automatically occur:

The internal audible device shall sound at the control panel or command center.

Display the alarm event on the graphical workstation.

The LCD Display shall indicate all applicable information associated with the alarm condition including: zone, device type, device location and time/date.

All system activity/events shall be documented on the system printer.

Any remote or local annunciator LCD/LED's associated with the alarm zone shall be illuminated.

The following audio messages and actions shall occur simultaneously:

An evacuation message shall be sounded on fire floors (zones) immediately above and below (adjacent to) the fire floor (zone) <general alarm evacuation>. It is the intent of this message to advise occupants hearing this message that they are near danger and should leave the building via the stairs (nearest exit) immediately.

Activate visual strobes on the fire floors <zones> immediately above and below (adjacent to) the fire floor (zone) <general alarm evacuation>. The visual strobe shall continue to flash until the system has been reset. The visual strobe shall not stop operating when the "Alarm Silence" is pressed.

An alert message shall be sounded on the remainder of building. It is the intent of this message to advise occupants to prepare for evacuation if necessary.

An instructional message shall be sounded in the stairwells instructing occupants to move carefully and quickly down the stairs to exit the building and to exit to a safe floor if you encounter smoke in the stairwell.

An instructional message shall be sounded in the elevator cabs. It is the intent of this message to advise elevator occupants that an emergency exists, the elevator has been directed to the ground floor, and that occupants should quickly exit the building.

An instructional message shall be sounded in the lobby. It is the intent of this message to advise lobby occupants to leave the lobby and clear the area for arriving firefighters.

An instructional message shall be sounded in the concourses connected to the building's lobby. It is the intent of this message to prevent new entries into the lobby by advising occupants not to attempt to enter the lobby of the affected building.

Provide selective paging to each individual floor (zone). In addition to the message/channels detailed above, a dedicated page channel shall be capable of simultaneously providing live voice instructions without interrupting any of the messages listed above shall be provided.

Transmit signal to the building automation system.

Transmit signal to the central station with point identification.

Activate automatic smoke control sequences.

All automatic events programmed to the alarm point shall be executed and the associated outputs activated.

All stairwell/exit doors shall unlock throughout the building.

All self-closing fire/smoke doors held open shall be released.

Direct the closed circuit TV cameras to the alarm event and start video recording.

Transmit alarm text messages to "alpha-numerical" display pagers.

1.3.3.1.3 Duct Smoke Activation - Alarm

<The following representative tasks should be customized for each project>

The alarm activation of any duct smoke detector, the following functions shall automatically occur:

The internal audible device shall sound at the control panel or command center.

Display the event on the graphical workstation and display a pictorial image.

The LCD display shall indicate all applicable information associated with the alarm condition including; zone, device type, device location and time/date.

All system activity/events shall be documented on the system printer. Any remote or local annunciator LED's associated with the alarm zone shall be illuminated.

Transmit signals to remote annunciators located in <building security desk, the engineer's office and the building management office.>

Transmit signal to the building automation system.

Transmit signal to the central station with point identification.

Shutdown the local air handling unit.

Transmit alarm text messages to "alpha-numerical" display pagers.

All automatic events programmed to the alarm point shall be executed and the associated outputs activated.

1.3.3.1.4 Duct Smoke Activation - Supervisory

<The following representative tasks should be customized for each project>

The supervisory activation of any duct smoke detector, the following functions shall automatically occur:

The internal audible device shall sound at the control panel or command center.

Display the event on the graphical workstation and display a pictorial image.

The LCD display shall indicate all applicable information associated with the supervisory condition including; zone, device type, device location and time/date.

All system activity/events shall be documented on the system printer.

Any remote or local annunciator LED's associated with the alarm zone

shall be illuminated.

Transmit signals to remote annunciators located in building security desk, the engineer's office and the building management office.

Transmit signal to the building automation system.

Transmit signal to the central station with point identification.

Shutdown the local air handling unit.

Transmit alarm text messages to "alpha-numerical" display pagers.

All automatic events programmed to the alarm point shall be executed and the associated outputs activated.

1.3.3.1.5 Supervisory Operation

<The following representative tasks should be customized for each project>

Upon supervisory activation of any sprinkler valve supervisory switch, fire pump off-normal, clean agent fire suppression system trouble, the following functions shall automatically occur:

The internal audible device shall sound at the control panel or command center.

Display the event on the graphical workstation and display a pictorial image.

The LCD display shall indicate all applicable information associated with the supervisory condition including; zone, device type, device location and time/date.

All system activity/events shall be documented on the system printer.

Any remote or local annunciator LCD/LED's associated with the supervisory zone shall be illuminated.

Transmit signal to the central station with point identification.

1.3.3.1.6 Trouble Operation

<The following representative tasks should be customized for each project>

Upon activation of a trouble condition or signal from any device on the system, the following functions shall automatically occur:

The internal audible device shall sound at the control panel or command center.

Display the event on the graphical workstation and display a pictorial image.

The LCD keypad display shall indicate all applicable information associated with the trouble condition including; zone, device type, device

location and time/date.

All system activity/events shall be documented on the system printer.

Any remote or local annunciator LCD/LED's associated with the trouble zone shall be illuminated.

Transmit signal to the central station with point identification.

1.3.3.1.7 Monitor Activation

<The following representative tasks should be customized for each project>

Upon activation of any device connected to a monitor circuit, the following functions shall automatically occur:

<The internal audible device shall sound at the control panel or command center >

Display the event on the graphical workstation and display a pictorial image.

<The LCD display shall indicate all applicable information associated with the status condition including; zone, device type, device location and time/date.>

<All system activity/events shall be documented on the system printer.>

Any remote or local annunciator LCD/LED's associated with the status zone shall be illuminated.

1.3.3.2 Fire Suppression System Interface

1.3.3.2.1 Fire Suppression System Interface

Smoke detection within the hazard area shall be provided by a grid of multi-sensor smoke detectors installed on <20 foot> centers. Activation of the first detector in the grid shall activate the "first detector" functions described below and condition the adjacent detectors in the grid to begin the release sequence, if activated. Activation of any adjacent detector shall start the "confirmation sequence" below.

<**Cross-Zone alternate to above paragraph** Smoke detection within the hazard area shall be provided by grid of alternating photoelectric and ionization smoke detectors installed on <20 foot> centers. Activation of any detector in the grid shall activate the "first detector" functions described below. Activation of a detector of a different type from the first detector activated shall start the "confirmation sequence" below. >

Provide an automatic extinguishing agent release interface modules at the locations shown on the drawings. The releasing interface shall be

suitable for controlling the release of extinguishing agents such as FM-200®, Inergen®, CO2, or Halon®, as well as sprinkler pre-action or deluge systems furnished by others.

Each interface shall provide supervised connections for: two agent release solenoid valves, two supervised pre-release notification circuits, a supervised manual release circuit, and a supervised abort switch circuit.

Upon operation of the "first detector" associated with the protected area the system shall:

1. Activate fire alarm system
2. Display activated initiating device on graphic annunciator.
3. Activate visual pre-discharge notification appliances in protected area
4. Pulse the audible discharge notification appliances in the protected area
5. Release door holders and fire/smoke dampers
6. Shut down HVAC system supplying protected area
7. Shut down <customer specified equipment> in protected area

Upon confirmation of the alarm by a "second detector," the system shall:

1. Display second activated initiating device on graphic annunciator
2. Start the automatic discharge delay timer (selectable from 0 to 60 seconds in 10 sec. increments)
3. Cause the audible discharge notification appliances in the protected area audible to sound continuously 10 seconds before agent release.
4. Activate the agent release solenoids at the expiration of the automatic discharge delay timer.

Upon activation of the manual agent release station the system shall:

1. Activate fire alarm system
2. Display activated initiating device on graphic annunciator.
3. Activate visual pre-discharge notification appliances in protected area
4. Pulse the audible discharge notification appliances in the protected area
5. Release door holders and fire/smoke dampers
6. Shut down HVAC system supplying protected area
7. Shut down <customer specified equipment> in protected area
8. Start the manual discharge delay timer (selectable from 0 to 30 seconds in 10 sec. increments)
9. Cause the audible discharge notification appliances in the protected area audible to sound continuously 10 seconds before agent release.
10. Activate the agent release solenoids at the expiration of the automatic discharge delay timer.

System Abort

<Select appropriate abort mode>

<If the abort switch is activated before the automatic discharge delay expires, the system will prevent agent release, however the automatic release delay timer will continue to run while the abort switch is active. When the abort switch is restored, agent release will occur upon expiration of the automatic delay timer or the abort delay timer (selectable for 0 or 10 seconds), whichever occurs last.>

< If the abort switch is initiated before the automatic discharge delay expires, the system will prevent agent release and the automatic delay timer will stop. When the abort switch is restored, the automatic delay timer will resume from the stop point and agent release will occur with the expiration of the timer.>

< The abort switch must be active when the second or confirmation alarm indication is received in order to abort agent release. When the abort switch is restored, the release will occur with the expiration of the 10 second abort delay timer. (Industrial Risk Insurers (IRI) Mode)>

<If the abort switch is initiated before the automatic discharge delay timer expires, the system will prevent agent release and the automatic discharge delay timer will stop. When the abort switch is restored, the automatic discharge delay timer will reset and restart at $t = 0$. Agent release will occur with the expiration of the timer setting less 10 seconds.

1.3.3.3 Graphic Workstation

1.3.3.3.1 Graphic Workstation - Fire

Graphic Workstation Functions

All Events

Display the address of the alarm or off normal point with type and description and time of the event in a prioritized color-coded event list. Highlighting an event in the event list shall automatically cause the other three quadrants (described below) to display information relating to the highlighted event.

Display color graphical representation of the area in which the alarm or off normal device is located. It shall be possible for the operator to manually zoom down to any portion of a vector-based graphic without aliasing, artifacting, or pixilation of the image. Preset zoom levels shall not be considered equal.

Display a set of written operator instructions for each event, site programmability of the message must be provided allowing modification by the end user to suit occupancies and emergency plans. The Workstation must provide simple control via a two button mouse.
Display a preset stored image of the device
Log operator's comments for each event to history with time and date.
Log all events and operator actions to history for future review.

Fire alarms

Shall be capable of acknowledging, silencing, and resetting fire alarm functions.

Shall be capable of manually activating, deactivating, enabling, and disabling individual fire alarm points.

Shall be capable of generating status, maintenance and sensitivity reports for all fire alarm components.

Receipt of a fire alarm shall activate an audio WAV file over the workstation speakers alerting the operator to a fire alarm, and providing audible instructions.

Maintenance and Control Functions

Control capability

Reports: status, sensitivity.

1.3.3.3.2 Graphic Workstation - Fire - Security - Access Control

Graphic Workstation Functions

All Events

Display the address of the alarm or off normal point with type and description and time of the event in a prioritized color-coded event list. Highlighting an event in the event list shall automatically cause the other three quadrants (described below) to display information relating to the highlighted event.

Display color graphical representation of the area in which the alarm or off normal device is located. It shall be possible for the operator to manually zoom down to any portion of a vector-based graphic without aliasing, artifacting, or pixilation of the image. Preset zoom levels shall not be considered equal.

Display a set of written operator instructions for each event, site programmability of the message must be provided allowing modification by the end user to suit occupancies and emergency plans. The Workstation must provide simple control via a two button mouse.

Display a preset CCTV video or stored image of the device
Log operator's comments for each event to history with time and date.
Log all events and operator actions to history for future review.

Fire alarms

Shall be capable of acknowledging, silencing, and resetting fire alarm functions.

Shall be capable of manually activating, deactivating, enabling, and disabling individual fire alarm points.

Shall be capable of generating status, maintenance and sensitivity reports for all fire alarm components.

Receipt of a fire alarm shall activate an audio WAV file over the workstation speakers alerting the operator to a fire alarm, and providing audible instructions.

Security Events

Shall be capable of acknowledging and silencing security event functions.

Shall be capable of manually activating, deactivating, arming, disarming, enabling, and disabling individual security points and /or partitions.

Shall be capable of generating status reports for all security devices.

Receipt of a security event shall activate an audio WAV file over the workstation speakers alerting the operator to a security event.

Access Control Events

Shall be capable of acknowledging access control event functions.

Shall be capable of manually activating, deactivating, arming, disarming, enabling, disabling, opening, unlocking, closing, and locking individual doors.

Shall be capable of manually enabling and disabling card readers.

Shall be capable of generating status reports for all card reader controllers.

Receipt of a access control event activate an audio WAV file over the workstation speakers alerting the operator to a security event.

Closed Circuit Television (CCTV)

Shall provide a video display on one quadrant of the workstation as received from the CCTV switcher-multiplexer.

Shall command the switcher-multiplexer to direct the appropriate camera to the preset azimuth and elevation for each event, and sent this image to the workstation.

Shall provide manual pan, tilt, and zoom control signals to the switcher-multiplexer.

Maintenance and Control Functions

Control capability
Reports: status, sensitivity.

1.3.3.4 Security

1.3.3.4.1 Perimeter Security

Perimeter Security - Activation of any armed perimeter security device shall perform the following operations:

Show the location and type of alarm sensor on the keypad display.
Notify the remote central monitoring station(s) with the group, system location, and device location of the alarm event.
Activate local sounders or voice communication system.
Notify the building command center with the group, system location, and device location of the alarm event.
Display a graphic representation of the alarm location, device type, operator instructions and video call-up on the event driven graphic workstation.
Send a digital message to an alphanumeric pager(s) for designated employees.
Send a digital signal to the video controller, enabling alarm call-up and VCR recording of the alarm event.
Log and record the alarm event.

1.3.3.4.2 Interior Security

Interior Security - Activation of any armed interior security device shall perform the following operations;

Notify the location and type of alarm sensor on the keypad display.
Notify the remote central monitoring station(s) with the group, system location, and device location of the alarm event.
Activate local sounders or voice communication system.
Notify the building command center with the group, system location, and device location of the alarm event.
Display a graphic representation of the alarm location, device type, operator instructions and video call-up on the event driven graphic workstation.
Send a digital message to an alphanumeric pager(s) for designated employees.
Send a digital signal to the video controller, enabling alarm call-up and VCR recording of the alarm event.
Log and record the alarm event.

1.3.3.4.3 Opening and Closing

Opening and Closing Operation - When a group(s) of security protection are closed (secured) and opened (unsecured) the following shall occur:

The entry reader by the employee entrance door will open the door and deactivate the perimeter and interior security groups for the facility. Upon securing the group(s) for the facility, the LCD keypad display will indicate the status of the security group(s) and the related devices. If the security group(s) are secure, an authorized user will put the security code into the LCD keypad display and activate or secure the security groups authorized. An internal adjustable exit timer will activate shunting the employee entrance door until the entrance door is closed or the timer expires.

1.3.3.4.4 Hold up and Duress

Hold Up or Duress - Activation of any duress security device shall perform the following operations;

Notify the remote central monitoring station(s) with the group, system location, and device location of the alarm event.

Notify the building command center with the group, system location, and device location of the alarm event.

Display a graphic representation of the alarm location, device type, operator instructions and video call-up on the event driven graphic workstation.

Send a digital message to an alphanumeric pager(s) for designated employees.

Send a digital signal to the video controller, enabling alarm call-up and VCR recording of the alarm event.

Log and record the alarm event.

1.3.3.5 Access Control

1.3.3.5.1 Card Access Database Program

Card Access Database Application Program

The card access database (CAD) application program shall be designed to administer the functions necessary for access control. The program shall operate under Windows® 2000 with intuitive, easy to operate capabilities for any novice PC user. The CAD can be installed on a single PC or on a server allowing multiple users full access to the database. The CAD shall support multi-tenant applications, segregating databases for each tenant.

The CAD shall employ an ODBC database engine that stores cardholder and system configuration information. The CAD shall enable the user to add, change or delete cardholder information, schedules, access levels, etc. The CAD shall contain the ability to retrieve, filter and generate reports uploaded from the card reader controllers. The CAD shall archive and log system activity and create history logs that will enable a user with the ability to retrieve the information as required.

1.3.3.5.2 Parking Gate

Parking Gate Operator - The following will occur when a parking gate operator is equipped with a card reader, gate arm, request to exit device and loop detector;

The card reader controller (CRC) shall read the credential code presented to the card reader and either deny or grant permission to the gate controller depending on the authorization permissions of the credential holder.

When a valid credential is presented, the green LED shall light continuous for a period determined by the reader capabilities or until another credential is presented. When an invalid credential is presented, the red LED shall flash continuous for a period determined by the reader capabilities or until another credential is presented. The parking gate reader shall have a read range of 3 feet minimum.

When a vehicle passes through and clears the gate and clears the vehicle detection device, the gate controller shall close the gate arm.

On egress, a vehicle detection device will activate the gate controller and lift the gate arm to allow the vehicle clearance. When the vehicle clears the vehicle detection device on the other side, the gate controller will close the gate arm.

1.3.4 System Configuration

1.3.4.1 General

All Life Safety System equipment shall be arranged and programmed to provide the early detection of fire, the notification of building occupants, the automatic summoning of the local fire department, the override of the HVAC system operation, and the activation of other auxiliary systems to inhibit the spread of smoke and fire, and to facilitate the safe evacuation of building occupants.

1.3.4.2 General - Fire - Security - Access Control

The system supplied under this specification shall utilize node to node, direct

wired, multi-priority peer-to-peer network operations. The system shall utilize independently addressed, smoke detectors, heat detectors, input/output modules, intrusion detection and card reader controllers as described in this specification. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote control panels, LCD/LED annunciation nodes, and workstations. Each node is an equal, active functional member of the network, which is capable of making all local decisions and generating network tasks to other nodes in the event of node failure or communications failure between a nodes.

All integrated life safety system equipment shall be arranged and programmed to provide an integrated system for the early detection of fire, the notification of building occupants, the automatic summoning of the local fire department, the override of the HVAC system operation, and the activation of other auxiliary systems to inhibit the spread of smoke and fire, and to facilitate the safe evacuation of building occupants. In all operating modes, the processing of fire alarms shall have the highest priority.

Devices shall be listed for both fire and security applications. System performance shall not be degraded fire and security devices are installed in the same system. Fire alarm, intrusion, access control and video functions shall be partitioned to permit virtual-independent operation.

All integrated system operation shall be based on application programming in order to provide the greatest flexibility in integrating fire, intrusion, access control and video functions, and assure compliance with all required codes and standards.

1.3.4.3 Power Supply

Standby power supply shall be an electrical battery with capacity to operate the system under maximum supervisory load for <insert 24 or 60> hours and capable of operating the system for <5> minutes in the alarm mode at 100% load. The system shall include a charging circuit to automatically maintain the electrical charge of the battery. The system shall automatically adjust the charging of the battery to compensate for temperature.

1.3.4.4 Power Supply - Audio

Standby power supply shall be an electrical battery with capacity to operate the system under maximum supervisory load for <insert 24 or 60> hours> and capable of operating the system for fifteen (15) minutes of evacuation alarm on all devices, operating at maximum load. The system shall include a charging circuit to automatically maintain the electrical charge of the battery. The system shall automatically adjust the charging of the battery to

compensate for temperature.

1.3.4.5 Display

The main display interface shall show the first and most recent highest priority system events without any operator intervention. All system events shall be directed to one of four message queues. Messages of different types shall never intermixed to eliminate operator confusion. A "Details" switch shall provide additional information about any device highlighted by the operator.

1.3.4.6 Initiating Device Circuits

Initiating device circuits monitoring manual fire alarm stations, smoke and heat detectors, waterflow switches, valve supervisory switches, fire pump functions, and air pressure supervisory switches shall be <Class A (Style "D" or "E")>< Class B (Style "A" or "B").> Initiating device circuits monitoring magnetic security contacts, motion detectors, duress station, glass break and intrusion type devices, shall be Class B (Style "A" or "B").

1.3.4.7 Notification Appliance Circuits

All notification appliance circuits shall be <Class A (Style "Z")><Class B (Style "Y")>. All notification appliance circuits shall have a minimum circuit output rating of: 2 amps @ 24 vdc; 50 watts @ 25V audio, and 35 watts @ 70V audio. The notification circuits shall be power limited. Non-power limited circuits are not acceptable.

1.3.4.8 Signaling Line Circuits

When a signaling line circuit covers more than one fire/smoke compartment, a wire-to-wire short shall not effect the operation of the circuit from the other fire/smoke compartments. The signaling line circuit connecting network panel/nodes, annunciators, command centers, shall be <Class A (style 7)>< Class B (style 4).> The media shall be copper except where fiber optic cable is specified on the drawings.

The signaling line circuit connecting to addressable/analog devices including, detectors, monitor modules, control modules, isolation modules, intrusion detection modules and notification circuit modules shall be <Class A (style 6 or 7)>< Class B (style 4).>

The signaling line circuit connecting to the audio communications (pre-amp signal), amplifiers, and nodes shall be <Class A (style 6)>< Class B (style 4).> The circuit shall be power limited.

The signaling line circuit connecting to the two-way communications circuit (riser) shall be <Class A (style 6)>< Class B (style 4).>

The signaling line circuit connecting to access control card reader controller and keypads/displays shall be <Class A (style 6)>< Class B (style 4).>

1.3.4.9 Network Wiring

The system supplied under this specification shall utilize node to node, direct wired multi-priority peer-to-peer network operations. The system shall utilize independently addressed, smoke detectors, heat detectors and input/output modules <intrusion detection> as described in this specification. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote control panels, LCD/LED annunciation nodes, and workstations. Each node is an equal, active functional node of the network, which is capable of making all local decisions and generating network tasks to other nodes in the event of node failure or communications failure between a nodes.

When a network is wired in a Class B configuration, a single break or short on the network wiring isolates the system into two groups of panels. Each group continues to function as a peer-to-peer network working with their combined databases. When wired using a Class A configuration, a single break or short on the network wiring causes the system to isolate the fault, and network communication continues uninterrupted, without any loss of function. Should multiple wiring faults occur, the network re-configures into many sub-networks and continues to respond to alarm events from every panel that can transmit and receive network messages.

1.3.4.10 Network Nodes

The remote control panel(s) (network nodes) shall meet the same requirements as described in control panel section and shall contain the following;

<Common control switches with 168 character LCD display, as required.>

Integral power supply(s) with secondary stand-by power.

Signaling line circuits for communications with analog/addressable devices, as required.

Audio amplification, as required.

Notification appliance circuits, as required.

Auxiliary function circuits and operations, as required.

1.3.4.11 DACT

The system shall provide off premise communications capability (DACT) for transmitting system events to multiple Central Monitoring Station (CMS) receivers. The system shall provide the CMS(s) with point identification of system events using Contact ID or SIA DCS protocols. The system shall provide an individual CMS account for each tenant, and send the required signals to the one or more CMS(s) and account(s) specified by each tenant. In the event of a panel CPU failure during a fire alarm condition, the DACT degrade mode shall transmit a general fire alarm signal to the CMS.
<The system shall also transmit an alphanumeric system activity message, by event, to a commercial paging system of the owners choice, using TAP Pager protocol.>

1.3.4.12 Two-Way Audio

The two-way telephone circuits shall be "Class B" (style D). The system shall provide a ring-tone.

1.3.4.13 Security

All intrusion detection system equipment shall be arranged and programmed to provide an integrated system for the intrusion detection, local notification on premises, the notification of a UL listed central monitoring center, and the activation of other auxiliary systems required to annunciate and notify the proper authorities.

Intrusion detection devices shall be connected using intelligent distributed devices wired to a panel. Devices such as motions detectors, door position switches, dry-contact monitoring devices, glass break detectors, photoelectric beams, etc., shall be supported by intelligent monitoring devices or contain integral intelligent circuits required for monitoring. Security functions provided by the system shall include; partitioning, interior security, perimeter security, day security, bypassing, entry/exit delays, audible notification, bi-lingual support, international language support, and annunciation.

The one-way voice messaging system equipment shall be configured and programmed to provide a command and response messages related to access control and/or intrusion detection systems under normal or abnormal conditions.

1.3.4.14 Access Control

All access control equipment shall be configured and programmed to provide a distributed integrated system for the processing of credentials presented for ingress or egress of protected entry or exit areas and the activation of

other auxiliary systems required to annunciate and manage the system on or off premise.

The card reader controller (CRC) shall be designed to accommodate complete information for up to 36,000 individuals and will process egress or ingress decisions based on the CRC database and permissions granted by each individual. The CRC shall be programmed to allow or disable event reporting to the network panel/node and shall have event storage capacity for up to 20,000 events.

Individual personnel information shall be programmed into the CRC using the node/panel network from an application program designed to administer and manage the access control system. The application program shall be Windows® 2000 or XP based and be able to operate on commercial off the shelf Intel based computers. The application program shall be able to operate as a single program or with other program applications operating on the computer. The computer shall connect through a direct RS-232 connection, fiber optic cable connection or IP connection. The application program shall be able to store, report and manage event activities related to access control functions.

1.4 Submittals

1.4.1 Project

The contractor shall purchase no equipment for the system specified herein until the owner has approved the project submittals in their entirety and has returned them to the contractor. It is the responsibility of the contractor to meet the entire intent and functional performance detailed in these specifications. Approved submittals shall only allow the contractor to proceed with the installation and shall not be construed to mean that the contractor has satisfied the requirements of these specifications. The contractor shall submit three (3) complete sets of documentation within 30 calendar days after award of purchase order.

Each submittal shall include a cover letter providing a list of each variation that the submittal may have from the requirements of the contract documents. In addition the Contractor shall provide specific notation on each shop drawing, sample, catalog cut, data sheet, installation manual, etc. submitted for review and approval, of each such variation.

All drawings and diagrams shall include the contractor's title block, complete with drawing title, contractor's name, address, date including revisions, and preparer's and reviewer's initials

Product Data

Data sheets with the printed logo or trademark of the manufacturer for all equipment. Indicated in the documentation will be the type, size, rating, style, and catalog number for all items proposed to meet the system performance detailed in this specification. The proposed equipment shall be subject to the approval of the Architect/Engineer.

Shop Drawings

A complete set of shop drawings shall be supplied. The shop drawings shall be reproduced electronically in digital format. This package shall include but not be limited to:

Control panel wiring and interconnection schematics.

Complete point to point wiring diagrams.

Riser diagrams.

Complete floor plan drawing locating all system devices and 1/4" = 1'-0" scale plan and elevation of all equipment in the Fire Command Station. Including showing the placement of each individual item of fire alarm, security, and access control equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.

Detailed system operational description. Any Specification differences and deviations shall be clearly noted and marked.

Complete system bill of material.

All drawings shall be reviewed and signed off by an individual having a minimum of a NICET certification in fire protection engineering technology, subfield of fire alarm systems.

Samples

A sample of each smoke detector, intelligent modules, horn, strobes, card reader controller, card reader, and door locking mechanism shall be provided to the contractor for their familiarization.

Quality Assurance/Control Submittals

Installer's Certification

The engineered systems distributor must be licensed in the state of project location and have been incorporated in the business in that state for a minimum of 5 years.

Submit a copy of the system supplier's training certification issued by the manufacturer of the integrated life safety system, and a copy of the installing technician's NICET certification.

System Calculations

Complete calculations shall be provided which show the electrical load on the following system components:

Each system power supply, including stand alone booster supplies.

Each standby power supply (batteries).

Each notification appliance circuit.

Each auxiliary control circuit that draws power from any system power supply.

1.4.2 Close Out

Two (2) copies of the following documents shall be delivered to the building owner's representative at the time of system acceptance. The close out submittals shall include:

Project specific operating manuals covering the installed integrated life safety system. The manual shall contain a detailed narrative description of the system architecture, inputs, notification signaling, auxiliary functions, annunciation, sequence of operations, expansion capability, application considerations and limitations. Manufacturer's data sheets and installation manuals/instructions for all equipment supplied. A generic or typical owner's instruction and operation manual shall not be acceptable to fulfill this requirement.

As-Built drawings consisting of: a scaled plan of each building showing the placement of each individual item of the Integrated Life Safety System equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway. All drawings must reflect point to point wiring, device address and programmed characteristics as verified in the presence of the engineer and/or the end user unless device addressing is electronically generated, and automatically graphically self-documented by the system.

All drawings shall be provided in standard .DXF format. A vellum plot of each sheet shall also be provided.

The application program listing for the system as installed at the time of acceptance by the building owner and/or local AHJ (disk, hard copy printout, and all required passwords).

Provide the name, address and telephone of the authorized factory representative.

A filled out Record of Completion similar to NFPA 72, 1999 edition figure 1-6.2.1.

1.5 Quality Assurance

1.5.1 Qualifications of Contractor

1.5.1.1 Fire

The contractor shall have successfully installed similar system fire detection, evacuation voice and visual signaling control components on a previous project of comparable size and complexity. The owner reserves the right to reject any control components for which evidence of a successful prior installation performed by the contractor cannot be provided.

The contractor shall have in-house engineering and project management capability consistent with the requirements of this project. Qualified and approved representatives of the system manufacturer shall perform the detailed engineering design of central and remote control equipment. Qualified and approved representatives of the system manufacturer shall produce all panel and equipment drawings and submittals, operating manuals. The contractor is responsible for retaining qualified and approved representative(s) of those system manufacturers specified for detailed system design and documentation, coordination of system installation requirements, and final system testing and commissioning in accordance with these specifications.

1.5.2 Pre-installation Meetings

1.5.2.1 Pre-Installation Requirements

The provider shall submit a detailed project plan that will describe in detail how the provider will approach the project, from inception to finalization. The plan must include at a minimum the following information:

- Project Staging
- Project Management
- Equipment Schedules
- Installation Time Lines
- Other Trade Requirements
- Final Acceptance Testing
- Personnel Resumes
- Progress Report Sample

All equipment and components shall be installed in strict compliance with each manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation. Refer to the manufacturers riser/connection diagram and details for all specific system installation/termination/wiring data.

1.5.2.2 Start and Completion Dates

The starting and completion dates for this work will be established at the pre-bid meeting.

1.5.2.3 Submission of Bid

Bids will be due at or before 3:00 P.M., local time, on <Insert Date> at:
<Insert Name & Address>

Copies to: <Insert Name & Address>

Bids shall be submitted on the bid form. Four (4) copies of the bid form shall be submitted and one copy retained by the bidder for his records. All blank spaces for bid prices shall be filled using ink or typewritten. Any exceptions to the bid documents or qualification of the bidder's bid shall be fully explained where indicated on the bid form.

1.6 Delivery, Storage and Handling

1.6.1 Receiving and Handling

The Contractor shall be responsible for all receiving, handling, and storage of his materials at the job site.

Use of loading docks, service driveways, and freight elevators shall be coordinated with the Owner.

1.6.2 Storage

The Owner will provide the Contractor with a lockable storage space for the Contractor's use during this project. The Contractor shall be responsible for the security of this space.

Overnight storage of materials is limited to the assigned storage area. Materials brought to the work area shall be installed the same day, or returned to the assigned storage area unless previously approved by the Owner.

1.6.3 Rubbish

The Contractor shall remove rubbish and debris resulting from his work on a daily basis. Rubbish not removed by the Contractor will be removed by the Owner and back-charged to the Contractor.

Removal of debris and rubbish from the premises shall be coordinated with the Owner.

1.7 Project Conditions

1.7.1 Project Conditions

It shall be the Contractor's responsibility to inspect the job site and become familiar with the conditions under which the work will be performed. Inspection of the building may be made by appointment with the Owner. Contractors are requested to inspect the building prior to the pre-bid meeting.

A pre-bid meeting will be held to familiarize the Contractors with the project. Failure to attend the pre-bid meeting may be considered cause for rejection of the Contractor's bid. The minutes of this meeting will be distributed to all attendees and shall constitute an addendum to these specifications.

All work, except for <INSERT>, may be conducted during normal working hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, by properly coordinating the work with the Owner. Noise restrictions do apply. The core drilling, testing of evacuation signals and other work disruptive to occupants will be prohibited between 6:00 a.m. and 6:00 p.m., Monday through Friday, and will be explained at the pre-bid meeting. <NOTE: Add exclusion as needed for kitchens and other areas>. <OPTIONAL All system switch over shall be done during unoccupied hours or over weekends. Contractor is to include, in his base bid, all overtime necessary to complete his work.

The Contractor shall be responsible for prior coordination of all work and demolition with the Owner.

1.8 Warranty and Maintenance

1.8.1 Spare Parts

1.8.1.1 Spare Parts - Fire

The Contractor shall supply the following spare parts:

Automatic detection devices - Two (2) percent of the installed quantity of each type.

Manual fire alarm stations - Two (2) percent of the installed quantity of each type.

Glass rods or panels for break glass manual fire alarm stations (if used) - <Ten> percent of the installed quantity, but no less than two devices.

Audible and visible devices - One (1) percent of the installed quantity of each

type, but no less than two (2) devices.

Keys - A minimum of three (3) sets of keys shall be provided and appropriately identified.

1.8.2 Warranty

The contractor shall warranty all materials, installation and workmanship for one (1) year from date of acceptance, unless otherwise specified. A copy of the manufacturer's warranty shall be provided with close-out documentation and included with the operation and installation manuals.

The System Supplier shall maintain a service organization with adequate spare parts stock within 75 miles of the installation. Any defects that render the system inoperative shall be repaired within 24 hours of the owner notifying the contractor.

1.9 Training

1.9.1 Training

The System Supplier shall schedule and present a minimum of 8 hours of documented formalized instruction for the building owner, detailing the proper operation of the installed System.

The instruction shall be presented in an organized and professional manner by a person factory trained in the operation and maintenance of the equipment and who is also thoroughly familiar with the installation.

The instruction shall cover the schedule of maintenance required by NFPA 72 and any additional maintenance recommended by the system manufacturer.

Instruction shall be made available to the Local Municipal Fire Department if requested by the Local Authority Having Jurisdiction.

PART 2 Products

2.1 Manufacturer

2.1.1 Fire

The manufacturer of the system equipment shall be regularly involved in the design, manufacture, and distribution of all products specified in this document. These processes shall be monitored under a quality assurance program that meets the ISO 9000 requirements.

All System components shall be the cataloged products of a single supplier. All products shall be listed by the manufacturer for their intended purpose.

Edwards Systems Technology, Inc. products constitute the minimum type and quality of equipment to be installed.

All control panel assemblies and connected field appliances shall be both designed and manufactured by the same company, and shall be tested and cross-listed as to ensure that a fully functioning is designed and installed. The system supplied under this specification shall be a microprocessor-based direct wired, multi-priority peer-to-peer networked system. The system shall utilize independently addressed, microprocessor-based smoke detectors, heat detectors, and modules as described in this specification.

2.2 Panel Components & Functions

2.2.1 General

2.2.1.1 General - Fire

The control panel(s) shall be a multi-processor based networked system designed specifically for fire, one-way and two-way emergency audio communications, smoke control, <extinguishing agent releasing system>, and guard patrol applications. The control panel shall be listed and approved for the application standard(s) as listed under the General section.

The control panel shall include all required hardware, software and site specific system programming to provide a complete and operational system. The control panel(s) shall be designed such that interactions between any application can be configured, and modified using software provided by a single supplier. The control panel(s) operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel.

The control panel shall include the following capacities:

Support up to 2500 analog/addressable points.

Support network connections up to 63 other control panels and annunciators.

Support multiple digital dialers and modems

Support multiple communication ports and protocols

Support up to 1740 chronological events.

The network of control panels shall include the following features:

Ability to download all network applications and firmware from the configuration computer from the configuration computer from a single

location on the system.

Provide electronic addressing of analog/addressable devices.

Provide an operator interface control/display that shall annunciate, command and control system functions.

Provide an internal audible signal with different programmable patterns to distinguish between alarm, supervisory, trouble and monitor conditions.

Provide a discreet system control switch provided for reset, alarm silence, panel silence, drill switch, previous message switch, next message switch and details switch.

Provide system reports that provide detailed description of the status of system parameters for corrective action or for preventative maintenance programs. Reports shall be displayed by the operator interface or capable of being printed on a printer.

Provide an authorized operator with the ability to operate or modify system functions like system time, date, passwords, holiday dates, restart the system and clear control panel event history file.

Provide an authorized operator to perform test functions within the installed system.

The control panel shall contain a standby power supply that automatically supplies electrical energy to the system upon primary power supply failure. The system shall include a charging circuit to automatically maintain the electrical charge of the battery.

2.2.2 Operator's Interface

2.2.2.1 Display

System Message Processing and Display Operations:

The system shall allow network functions to be configured to apply to any combination of nodes (panels) in the network.

Each control panel (network node) shall be capable of supporting a printer. All system control panel printer ports shall be configurable to output any combination of alarm, supervisory, trouble, monitor, or service group event messages.

Each control panel (network node) shall be capable of supporting a LCD display. The display on each system node (cabinet) shall be configurable to display the status of any and all combinations of all alarm, supervisory, trouble, monitor, or service group event messages.

From each LCD display on the system shall be capable of being programmed

for control functions of any node or the entire network. The LCD display shall reside on the network as a node and continue to operate with any fault on the network. An LCD shall be capable of being programmed to only be operational when a node is in stand alone mode, with a network fault.

The system program shall have a minimum of 100 system definable service groups definable within the program to allow facilitate the testing of installed system based on the physical layout of the system. Service groups that disable the wiring of circuits serving multiple floors or fire zones shall not be considered as equal.

Advanced Windows® based programming with program version reporting to document any and all changes made during system start-up or system commissioning. Time and date stamps of all modifications made to the program must be included to allow full retention of all previous program versions data.

The operator display shall clearly identify unacknowledged and acknowledged alarm, supervisory, trouble, and monitor status messages.

The system shall provide the ability to download data from the analog/addressable detectors to a PC while the system is on-line and operational in the protected premises. The downloaded data may then be analyzed in a diagnostic program supplied by the system manufacturer.

A standby power supply shall automatically supply electrical energy to the system upon primary power supply failure.

2.2.2.2 Annunciation

The system shall be designed and equipped to receive, monitor, and annunciate signals from devices and circuits installed throughout the building. Standard LED annunciators may be combined in common enclosures provided that the groups of LED's comprising each of the required annunciators are separated from one another (Detection, Supervisory, Status, and Status) and clearly labeled.

Manufacturers' standard control switches shall be acceptable if they provide the required operation, including performance, supervision and position indication. If the manufacturers' standard switches do not comply with these requirements, fabrication of custom manual controls acceptable to the Owner is required.

Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote annunciation

device. The integral audible devices shall produce a sound output upon activation of not less than 85 dBA at 10 feet. The annunciator shall contain the following system status indicators:

- 168 character backlit Liquid Crystal Display
- System Normal Indicator
- System Common Alarm Indicator
- System Common Trouble Indicator
- System Common Supervisory Indicator
- System Ground Fault Indicator
- System Common Security Indicator
- System Disabled Point(s) Indicator
- System Reset Switch with Indicator
- System Alarm Silence Switch with Indicator
- System Trouble Silence Switch with Indicator
- System Message Queue Scroll Switches.
- 10-Digit Keypad to Enable/Disable System and Functions.

The LED annunciator rows shall contain the following format:

Provide one row of red (alarm) and yellow (trouble) LED's. LED's in each row shall be arranged in columns, one column per type of alarm initiating device, and shall illuminate upon receipt of an alarm signal from the associated device(s) (i.e., electrical room smoke detector).

Provide one row of red (alarm) LED's. LED's in each row shall be arranged in columns, one column per type of alarm initiating device, and shall illuminate upon receipt of an alarm signal from the associated device(s) (i.e., electrical room smoke detector).

Provide one row of yellow (supervisory) LED's. LED's in each row shall be arranged in columns, one column per type of supervisory type device, and shall illuminate upon receipt of an supervisory signal from the associated device(s) (i.e., 2nd floor sprinkler valve supervisory switch)

The LED annunciator shall be provided with <25>% spare LED's minimum. Each pair of LED's shall be labeled "Spare".

2.2.2.3 Annunciation - Audio

The system shall be designed and equipped to receive, monitor, and annunciate signals from devices and circuits installed throughout the building. Standard LED annunciators may be combined in common enclosures provided that the groups of LED's comprising each of the required annunciators are separated from one another (Detection, Supervisory, Status, and Security) and clearly labeled.

Manufacturers' standard control switches shall be acceptable if they provide

the required operation, including performance, supervision and position indication. If the manufacturers' standard switches do not comply with these requirements, fabrication of custom manual controls acceptable to the Owner is required.

Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote annunciation device. The integral audible devices shall produce a sound output upon activation of not less than 85 dBA at 10 feet.

The annunciator shall contain the following system status indicators:

- 168 character Backlit Liquid Crystal Display
- System Normal Indicator
- System Common Alarm Indicator
- System Common Trouble Indicator
- System Common Supervisory Indicator
- System Ground Fault Indicator
- System Common Security Indicator
- System Disabled Point(s) Indicator
- System Reset Switch with Indicator
- System Alarm Silence Switch with Indicator
- System Trouble Silence Switch with Indicator
- System Message Queue Scroll Switches.
- 10-Digit Keypad to Enable/Disable System and Functions.

The LED Annunciator rows shall contain the following format:

Provide one row of red (alarm) and yellow (trouble) LED's. LED's in each row shall be arranged in columns, one column per type of alarm initiating device, and shall illuminate upon receipt of an alarm signal from the associated device(s) (i.e., electrical room smoke detector).

Provide one row of red (alarm) LED's. LED's in each row shall be arranged in columns, one column per type of alarm initiating device, and shall illuminate upon receipt of an alarm signal from the associated device(s) (i.e., electrical room smoke detector).

Provide one row of yellow (supervisory) LED's. LED's in each row shall be arranged in columns, one column per type of supervisory type device, and shall illuminate upon receipt of an supervisory signal from the associated device(s) (i.e., 2nd floor sprinkler valve supervisory switch)

The LED annunciator shall be provided with <25>% spare LED's minimum. Each pair of LED's shall be labeled "Spare".

The LED Annunciator shall contain the following switches:

Provide two-position switch to manually unlock all stairwell doors.

Provide eight (8) two position switches for system by-pass functions. Actual switch function shall be determined by the owner.

Provide a one-way emergency voice communication system annunciator with the following design:

This standard LED annunciator shall incorporate the microphone for the one-way and telephone handset for the two-way voice communication systems, including all required zone select and manual override control switches and the following LED indicators:

3-Position Switch

Provide 3-position switch for each evacuation signaling zone, with "Voice," "Auto" and "Evacuate" positions identified and two LED status indicators for each audio visual evacuation signaling "zone", one red and one yellow. These LED's shall illuminate to indicate respectively: 1) Evacuation signals activated (red), 2) Trouble in audio (speaker) or visual (strobe) circuit(s) (yellow).

2-Position Switch

Provide 2-position switch for each evacuation signaling zone, with "Voice" and "Auto" positions identified and two LED status indicators for each audio visual evacuation signaling "zone", one red and one yellow. These LED's shall illuminate to indicate respectively: 1) Evacuation signals activated (red), 2) Trouble in audio (speaker) or visual (strobe) circuit(s) (yellow).

All Call Switch 2- Position

Provide 2-position switch for "All-Call" to activate all the evacuation signaling zones, with "Voice" and "Auto" positions identified and two LED status indicators for each audio visual evacuation signaling "zone", one red and one yellow. These LED's shall illuminate to indicate respectively: 1) Evacuation signals activated (red), 2) Trouble in audio (speaker) or visual (strobe) circuit(s) (yellow).

All Call Switch 3-Position

Provide 3-position switch for "All-Call" to activate all the evacuation signaling zones, with "Voice", "Off" and "Auto" positions identified and two LED status indicators for each audio visual evacuation signaling "zone", one red and one yellow. These LED's shall illuminate to indicate respectively: 1) Evacuation signals activated (red), 2) Trouble in audio (speaker) or visual (strobe) circuit(s) (yellow).

Emergency Two-Way Voice Communication

Provide two LED status indicators for each two telephone zone, one red and one yellow. These LED's shall illuminate to indicate respectively: 1)

Telephone calling-in and call connected (red), 2) Trouble in circuit(s) (yellow).

2.2.3 Audio

The system shall be capable of delivering multi-channel audio messages simultaneously over copper and/or fiber media. All audio messages and live pages shall originate at the one-way audio control unit. The one-way audio control unit shall store pre-recorded audio messages digitally. These messages shall be automatically directed to various areas in a facility under program control. The system shall support remote cabinets with zoned amplifiers to receive, amplify and send messages through speakers over supervised circuits.

The one-way emergency audio control shall provide control switches to direct paging messages as follows:

"All Call" to direct the page messages to all areas in the facility, overriding all other messages and tones.

"Page to Evacuation Area" to direct the message to the evacuation area(s), overriding all other messages and tones.

"Page to Alert Area" to direct page messages to the area(s) receiving the alert message and tones, overriding all other messages and tones..

"Page to Balance Building" to direct page messages to the areas) in the facility NOT receiving either the evacuation area or alert area messages.

"Page by Phone" switch to select the firefighters telephone system as the source for paging.

The system shall be capable of delivering multiple audio messages simultaneously over copper and / or fiber media. All audio messages and live pages shall originate at the one-way emergency audio control unit. The one-way emergency audio control unit shall store pre-recorded audio messages digitally. These messages shall automatically directed to various areas in a facility under program control. The system shall support remote panels with zoned amplifiers to receive, amplify and distribute messages through speakers over supervised circuits.

The two-way voice communications control unit shall provide two-way communications between remotely located phones and the command center. The control unit shall provide the ability to individually select and display each two-way voice communication circuit support up to five (5) remote telephones in simultaneous two-way voice communications.

Audio Amplifiers (Multi-Channel)

Provide as minimum one twenty (20) watt audio amplifier per paging zone. The system software shall be capable of selecting the required audio source signal for amplification. To enhance system survivability, each audio amplifier shall

automatically provide a local 3-3-3 1000 Hz temporal pattern output upon loss of the audio communications with the one-way audio control unit, during an alarm condition. Audio amplifiers shall be power limited and protected from short circuits conditions on the audio circuit wiring. Each amplifier output shall include a dedicated, selectable 25/70 Vrms output. Provide a standby audio amplifier that will automatically sense the failure of a primary amplifier, and replace the function of the failed amplifier.

2.2.4 DACT Dialer

The system shall provide off premise communications capability using a digital alarm communications transmitter (DACT) for sending system events to multiple central monitoring station (CMS) receivers. The system shall provide the CMS(s) with point identification of system events using Contact ID or SIA DCS protocols. <The system shall also transmit an alphanumeric system activity message, by event, to a commercial paging system of the owners choice, using TAP Pager protocol.> The system shall provide an individual CMS account for each tenant, and send the required signals to the one or more CMS(s) and account(s) specified by each tenant. In the event of a panel CPU failure during a fire alarm condition, the DACT degrade mode shall transmit a general fire alarm signal to the CMS.

2.2.5 Pager Interface

The system shall provide a module capable of transmitting alphanumeric system activity, by event, to a commercial paging system using TAP pager protocol. The system module shall be equipped with a high speed (V.32BIS or greater 14.4Kbaud) modem.

2.2.6 Power Supply

System power supply(s) shall provide multiple power limited 24 VDC output circuits as required by the panel.

Upon failure of normal (AC) power, the affected portion(s) of the system shall automatically switch over to secondary power without losing any system functions.

Each system power supply shall be individually supervised. Power supply trouble signals shall identify the specific supply and the nature of the trouble condition.

All standby batteries shall be continuously monitored by the power supply. Low battery and disconnection of battery power supply conditions shall immediately annunciated as battery trouble and identify the specific power supply affected.

All system power supplies shall be capable of recharging their associated batteries, from a fully discharged condition to a capacity sufficient to allow the system to perform consistent with the requirements of this section, in 48 hours maximum.

All AC power connections shall be to the building's designated emergency electrical power circuit and shall meet the requirements of NFPA 72 - The AC power circuit shall be installed in conduit raceway. The power circuit disconnect means shall be clearly labeled FIRE ALARM CIRCUIT CONTROL and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside the each control panel the disconnect serves.

2.2.7 Reports

The system shall provide the operator with system reports that give detailed description of the status of system parameters for corrective action, or for preventative maintenance programs. The system shall provide these reports via the main LCD, and shall be capable of being printed on any system printer.

The system shall provide a report that gives a sensitivity listing of all detectors that have less than 75% environmental compensation remaining. The system shall provide a report that provides a sensitivity (% Obscuration per foot) listing of any particular detector.

The system shall provide a report that gives a listing of the sensitivity of all of the detectors on any given panel in the system, or any given analog/addressable device loop within any given panel.

The system shall provide a report that gives a chronological listing of up to the last 1740 system events.

The system shall provide a listing of all of the firmware revision listings for all of the installed network components in the system.

2.2.8 System Printer

The event and status printer shall be a 9-pin, impact, dot matrix printer with a minimum print speed of 232 characters per second. The printer shall be capable of serial or parallel communications protocol. The communications speed for RS-232 communications protocol shall be adjustable from 300 to 9600 Baud. The printer shall list the time, date, type and user defined message for each event printed.

2.3 Graphic & Smoke Control Annunciators

2.3.1 Graphic Annunciator

The annunciator graphical diagram shall be <XX> inch per foot scale minimum and operating on nominal 24 Vdc. All annunciator switches shall be system input points and shall be capable of controlling any system output or function. The graphic annunciator shall be UL and ULC Listed. The graphic shall be back-lit using high intensity LEDs. The unit shall be <semi-flush> <surface> mounted. The main graphic door shall be tamper resistant and equipped with a key lock. It shall be possible to update the graphic image in the field without replacing the entire graphic.

<Provide a system LCD display mounted within the graphic enclosure.>

<Provide microphone and selector switches for the one-way voice communication system and required controls within the graphic enclosure.>

2.3.2 Firefighters Smoke Control Station

Provide a <semi-flush><surface> mounted graphic Firefighter's Smoke Control Station (FSCS) at the location(s) shown on the drawings. The FSCS shall provide a graphic representation of the facility HVAC system and stairwell pressurization system. Fan override and control switches and fan/damper status LEDs shall be provided as indicated on the shop drawings. The following system controls and indicators shall be provided on the FSCS: Power ON, Trouble, and Signal Silenced LEDs; System Reset, Silence, Trouble Silence, and Drill push buttons. < It shall be possible to annunciate text messages via LCD display mounted in the FSCS enclosure. > <The FSCS shall provide an integral remote microphone for one-way audio system paging.>

2.4 Graphic Command Workstation

2.4.1 Fire

2.4.1.1 General

The command center shall function as the center point for all operational and administration functions required for the systems provided within the specification. The command center shall contain a console that will display and house any equipment necessary for system operation. Console space shall be provided for other equipment provided under other sections of the specifications. A single graphical workstation shall be provided that will enable primary control of the systems provided by this specification. An operator shall not have to operate multiple workstations to receive, view, process and record system events for each system provided. Equipment

included in the command center shall include:

System annunciation and controls for.

<Fire detection.>

<Fire suppression.>

<Fire pump status>

<Firefighters smoke control.>

<Emergency one-way voice communications.>

<Standby generator status indication and controls.>

<Automatic transfer switch status indication and controls>

<Radio communications>

<Public intercom>

<Public telephone>

<Elevator monitor, status and controls>

2.4.1.2 Graphical Command Workstation

The graphical command workstation(s) shall display a different color text for each message type and color graphic diagrams/floor plans. The graphical command workstation shall simultaneously display the following system event views; system event display, graphical diagram display, detailed event message/instructions, and user event log. The workstation shall be an IBM-compatible personal computer listed for UL Standards 864 (Control Units for Fire-Protective Signaling Systems) under categories UOJZ, APOU, and UUKL. The workstation(s) shall be capable of annunciation and control of all fire detection and smoke control points.

The computer shall be minimum of an Pentium Grade Pentium Processor 2.4 Ghz with a 533Mhz front side bus, 512 MB RAM, 80 GB Hard Drive, and 18" LCD monitor. Installation of the computer or monitor can be either desktop or floor mounting or rack/panel mounting.

The software shall provide multitasking type environment that allows the user to run several applications simultaneously. The operating program shall run within a 32-bit operating system such as Windows® XP. These Windows applications shall run simultaneously with other programs. The mouse or Alt-Tab keys shall be used to quickly select and switch between multiple applications. The operator shall be able to work in Microsoft Word, Excel and other Windows based software packages, while concurrently annunciating on-line alarms and monitoring functions.

Graphic Workstation Operations

The graphic display screen shall organize and structure system events for easy user comprehension. The workstation display shall use four relational

quadrants. When any event occurs:

The "list of events area" shall display the address of the alarm or off-normal point with type and description and time of the event in a prioritized color-coded event list. Highlighting an event in the event list area shall automatically cause the display of a graphical map and other three areas (described below) to display information relating to the highlighted event.

The "map area" shall display color graphical representation of the area location in which the alarm or off-normal device is located. It shall be possible for the operator to manually zoom down to any portion of a vector-based graphic without aliasing, artifacting, or pixilation of the image. Preset zoom levels shall not be considered equal.

The "event action area" shall display a customized set of written operator instructions for every state (alarm, trouble, restore, etc.) of each point. An event log shall record all events and operator actions to history for future review. An operator's log shall record operator's comments for each event in system history with time and date.

The "image area" shall display a stored image of the device relating to the event highlighted in the event list area.

When processing fire alarm events the graphic workstation:

Shall be capable of acknowledging, silencing, and resetting all fire alarm functions.

Shall be capable of manually activating, deactivating, enabling, and disabling individual fire alarm points.

Shall be capable of generating status, maintenance and sensitivity reports for fire alarm components.

Receipt of a fire alarm shall activate an audio WAV file over the workstation speakers alerting the operator to a fire alarm<, and providing audible instructions.>

2.4.2 Fire - Security - Access Control

2.4.2.1 General

The command center shall function as the center point for all operational and administration functions required for the systems provided within the specification. The command center shall contain a console that will display and house any equipment necessary for system operation. Console space shall be provided for other equipment provided under other sections of the

specifications. A single graphical command workstation shall be provided that will enable primary control of the systems provided by this specification. An operator shall not have to operate multiple workstations to receive, view, process and record system events for each system provided. Equipment included in the command center shall be:

System annunciation and controls for.

Fire detection.

Fire suppression.

Fire pump status

Firefighters smoke control.

Intrusion detection.

Access control monitoring and administration.

Video surveillance.

Door unlocking system controls.

Emergency one-way voice communications.

Video imaging and badging.

<Standby generator status indication and controls.>

<Automatic transfer switch status indication and controls>.

<Radio communications>

<Public intercom>

<Public telephone>

<Video event recording>

<Elevator monitor, status and controls>

2.4.2.2 Graphical Command Workstation

The graphical command workstation(s) shall display a different color text for each message type and color graphic diagrams/floor plans. The graphical command workstation shall simultaneously display the following system event views; system event display, graphical diagram display, event video, detailed event message/instructions, and user event log. The workstation shall be an IBM-compatible personal computer listed for UL Standards 864 (Control Units for Fire-Protective Signaling Systems) under categories UOJZ, APOU, and UUKL; UL 1076, (Proprietary Burglar Alarm Units and Systems) under category APOU as applicable; and UL 294 (Access Control System Units). The workstation(s) shall be capable of annunciation and control of all fire detection, smoke control, intrusion detection and access control points.

The computer shall be minimum of a Pentium Grade Processor 2.4 GHz, with a 533MHz front side bus, 512 MB RAM, 80 GB Hard Drive, and 18" LCD monitor. Installation of the computer or monitor can be either desk top or floor mounting or rack/panel mounting.

The software shall provide multitasking type environment that allows the user to run several applications simultaneously. The operating program shall run within a 32-bit operating system such as Windows® XP. These Windows applications shall run simultaneously with other programs. The mouse or Alt-Tab keys shall be used to quickly select and switch between multiple applications. The operator shall be able to work in Microsoft Word, Excel and other Windows based software packages, while concurrently annunciating on-line alarms and monitoring functions.

Graphic Workstation Operations

The graphic display screen shall be displayed into four areas. When any event occurs:

The "list of events area" shall display the address of the alarm or off normal point with type and description and time of the event in a prioritized color-coded event list. Highlighting an event in the event list area shall automatically cause the display of a graphical map and other three panels areas (described below) to display information relating to the highlighted event.

The "map area" shall display color graphical representation of the area location in which the alarm or off normal device is located. It shall be possible for the operator to manually zoom down to any portion of a vector-based graphic without aliasing, artifacting, or pixilation of the image. Preset zoom levels shall not be considered equal.

The "event action area" shall display a customized set of written operator instructions for every state (alarm, trouble, restore, etc.) of each point. An event log shall record all events and operator actions to history for future review. An operator's log shall record operator's comments for each event in system history with time and date.

The "image area" shall display a <preset CCTV video> and/or <stored image of the device> relating to the event highlighted in the event list area.

When processing fire alarm events the graphic workstation:

Shall be capable of acknowledging, silencing, and resetting all fire alarm functions.

Shall be capable of manually activating, deactivating, enabling, and disabling individual fire alarm points.

Shall be capable of generating status, maintenance and sensitivity reports for fire alarm components.

Receipt of a fire alarm shall activate an audio WAV file over the workstation speakers alerting the operator to a fire alarm<, and providing audible instructions.>

When processing security events, the graphic workstation:
Shall be capable of acknowledging and silencing security event functions.
Shall be capable of manually activating, deactivating, arming, disarming, enabling, and disabling individual security points.
Shall be capable of generating status reports for all security devices.
Receipt of a security event shall activate an audio WAV file over the workstation speakers alerting the operator to a security event.

When processing access control events, the graphic workstation:
Shall be capable of acknowledging access control event functions.
Shall be capable of manually activating, deactivating, arming, disarming, enabling, disabling, opening, unlocking, closing, and locking individual doors.
Shall be capable of manually enabling and disabling card readers.
Shall be capable of generating status reports for all card reader controllers.

Receipt of an access control event activate an audio WAV file over the workstation speakers alerting the operator to a security/access event.

Upon receipt of any event, the workstation:
Shall command the CCTV switcher-multiplexer to direct the appropriate camera to the preset azimuth and elevation for each specific event, and sent send this image to the workstation.
Shall display the video image on one area of the workstation as received from the CCTV switcher-multiplexer.

Shall provide manual pan, tilt, and zoom control signals to the switcher-multiplexer.

2.4.2.3 Video Interface

A digital signal interface shall be provided between the computerized graphic workstation and the video switcher/multiplexer for camera control and video switching. The system shall be capable of automatically directing a pre-set camera view to a video window on the computerized graphic workstation and/or any video monitor connected to the video switcher/multiplexer. Individual camera pre-sets shall be programmable to activate in response to any event monitored by the life safety system.

Camera control shall include pan, tilt, and zoom functions. Pre-set camera control commands shall be supported for any camera connected to the video switcher/multiplexer capable of supporting pre-set commands. The system

shall be capable of manual camera control from either the computerized graphic workstation Graphical User Interface or through a video switcher/multiplexer control box.

2.5 Access Control

2.5.1 Access Control Database Program

The access control database application program shall be designed to administer the functions necessary for management of the access control services. The program shall operate under Windows® , 98, ME and 2000 with intuitive, easy to operate capabilities for any novice PC user. The program can be installed on a single PC or on a server allowing multiple users full access to the database over commercial LAN/WAN infrastructures. The program shall support multi-tenant applications, segregating databases for each tenant. The program shall employ an ODBC database engine that stores cardholder, system configuration information and assuring standard connectivity with other database applications. The program shall enable the user to add, change or delete cardholder information, schedules and access levels. The program shall contain the ability to retrieve, filter and generate reports uploaded from the card reader controllers. The program shall archive and log system activity and create history logs that will enable a user with the ability to retrieve the information as required.

2.5.2 Access Cards

A quantity of <xx> proximity access cards shall be provided. The card shall use passive technology for transmitting its encoded badge number to the reader. For security purposes, the card's internal data storage format shall be unique to the system supplier, and not be available from third party vendors. Cards must be compatible with the card readers supplied for the project.

The card shall be the approximate size and weight of a standard credit card, 2.125" x 3.375", (540mm x 857mm).

The card shall be suitable for direct printing with a video badging system.

The card shall accept a slot for either horizontal or vertical hanging, without affecting card operation.

2.5.3 Badging System

A video badging system shall be provided for the capture, storage, and

attachment of photographic images for each cardholder profile and printable to a badge. The system shall operate in using a Windows® 98, ME or 2000 operating platform and contain an ODBC compliant database. The video badging system shall interface with the Access Control Database Program to extract cardholder information for each cardholder. The video badging system shall contain management and storage functions for each card holder profile, image and badge background(s) for the creation of a photo identification badge.

Badge graphic design content and cardholder information shall be the responsibility of the owner.

2.5.4 Badge Printer

A color dye sublimation badge printer shall be provided as the output device from the video badging software. The printer shall contain current Windows® software drivers capable of communicating to Windows® 98, ME and 2000 operating systems.

A color resin thermal transfer badge printer shall be provided as the output device from the video badging software. . The printer shall contain current Windows® software drivers capable of communicating to Windows® 98, ME and 2000 operating systems.

The printer shall be capable of printing on one <two> card sides.

2.6 Field Mounted System Components

2.6.1 Fire Initiating Devices

2.6.1.1 Smoke Detectors & Accessories

2.6.1.1.1 Analog Addressable Smoke -- General

Each analog addressable smoke detector's sensitivity shall be capable of being programmed individually as: most sensitive, more sensitive, normal, less sensitive or least sensitive. In addition to the five sensitivity levels the detector shall provide a prealarm sensitivity setting, which shall be settable in 5% increments of the detector's alarm sensitivity value.

An alternate alarm sensitivity level shall be provided for each detector, which can be set to any of the five (5) sensitivity settings manually or automatically using a time of day event. In addition to the five alternate sensitivity levels the detector shall provide an alternate prealarm

sensitivity setting, which shall be settable in 5% increments of the detector's alternate alarm sensitivity value.

The detector shall be able to differentiate between a long drift above the prealarm threshold and fast rise above the threshold.

The detector's sensing element reference point shall automatically adjust, compensating for background environmental conditions such as dust, temperature, and pressure. Periodically, the sensing element real-time analog value shall be compared against its reference value. The detector shall provide a maintenance alert signal that 75% to 99% compensation has been used. The detector shall provide a dirty fault signal that 100% or greater compensation has been used.

The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and functions as the detector it replaced. System shall display an off-normal condition until the proper detector type has been installed or change in the application program profile has been made.

2.6.1.1.2 Beam Smoke Detector

The projected beam type smoke detector shall be a 4-wire 12/24 Vdc device used with UL listed separately supplied 4-wire control panels only. The unit shall be listed to UL 268 and shall consist of an integrated transmitter and receiver. The detector shall operate between a range of 15 and 330 ft. The temperature range of the beam shall be -22 °F to 131 °F. The beam detector shall feature automatic gain control, which will compensate for gradual signal deterioration caused by dirt accumulation on the lenses. The unit shall include a wall mounting bracket. Testing shall be carried out using a calibrated test filter.

2.6.1.1.3 Duct Detector Housing

Provide smoke detector duct housing assemblies to mount an analog/addressable detector along with a standard, relay or isolator detector mounting base. The housing shall also protect the measuring chamber from damage and insects. The housing shall utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten feet. Drilling templates and gaskets to facilitate locating and mounting the housing shall also be provided. The housing shall be finished in baked red enamel. Remote alarm LED indicators and remote test stations shall be provided.

2.6.1.1.4 Duct Detector Mounting Plate

Where smoke detectors are directly inserted into a low velocity ducts 3 ft (0.91m) high x 3 ft (0.91m) wide, ceiling plenums, or raised floors, provide factory supplied mounting plate assemblies to facilitate mounting the detectors. The mounting plate shall be code gauge steel with corrosion resistant red enamel finish. The detector mounting plate shall support an analog/addressable detector along with a standard, relay or isolator detector mounting base.

2.6.1.1.5 Smoke Detector - Ionization

Provide analog/addressable ionization smoke detectors at the locations shown on the drawings. The system shall have the ability to uniquely set the sensitivity and alarm verification values of each detector on a circuit. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. Each smoke detector shall be capable of transmitting prealarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient environmental thresholds approximately six times an hour. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 75% and 100% of the allowable environmental compensation value.

2.6.1.1.6 Smoke Detector - Multi-Sensor Ion Photo Thermal

Provide analog/addressable multisensor photoelectric thermal smoke detectors at the locations shown on the drawings. Alarm condition shall be based upon the combined input from the photoelectric, and thermal detection elements. Separately mounted photoelectric detectors, ionization detectors and heat detectors in the same location, clustered at the manufacturer's listed spacing is an acceptable alternative. The detector shall have the ability to set the sensitivity and alarm verification of each individual detector on the circuit. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. Each smoke detector shall be capable of transmitting prealarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity

settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient "environmental thresholds approximately six times an hour.. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 75% and 100% of the allowable environmental compensation value.

2.6.1.1.7 Smoke Detector - Multi-Sensor Photo Thermal

Provide analog/addressable multisensor smoke detectors at the locations shown on the drawings. Alarm condition shall be based upon the combined input from the photoelectric and thermal detection elements. Separately mounted photoelectric detectors and heat detectors in the same location, clustered at the manufacturer's listed spacing is an acceptable alternative. The detector shall have the ability to set the sensitivity and alarm verification of each individual detector on the circuit. It shall be possible to automatically set the sensitivity of individual analog/addressable detectors for the day and night periods.

Each smoke detector shall be capable of transmitting prealarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient environmental thresholds approximately six times an hour. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 75% and 100% of the allowable environmental compensation value.

2.6.1.1.8 Smoke Detector - Photoelectric

Provide analog/addressable photoelectric smoke detectors at the locations shown on the drawings. The detector shall have the ability to set the sensitivity and alarm verification of each of the individual detectors on the circuit. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. Each smoke detector shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient environmental thresholds approximately six times an hour. The microprocessor shall monitor the

environmental compensation value and alert the system operator when the detector approaches 75% and 100% of the allowable environmental compensation value.

2.6.1.1.9 Smoke Detector Guards

Smoke detector guards shall be installed at the locations shown on the drawings. The guards shall be Underwriters Laboratories tested and listed by for use with the smoke detectors they protect. Guard design shall not affect the detector operating sensitivity and shall not reduce the listed detector spacing. The guards shall be constructed of 16-gauge steel with a baked white finish to match the detectors. Tamperproof mounting hardware shall be provided.

2.6.1.2 Heat Detectors

2.6.1.2.1 Fixed Temperature-ROR Heat Detector. Explosionproof

Provide explosion proof / moisture proof heat detectors at the locations shown on the drawings. Detectors shall be rated at 15°F (9°C) per minute rate-of-rise and <135°F (57°C)><194°F (88°C)> fixed temperature. The detector shall be rated for Class 1, Group C & D, Class 2, Groups E, F, & G atmospheres.

2.6.1.2.2 Fixed Temperature-ROR Heat Detector

Provide analog/addressable combination fixed temperature / rate-of-rise detectors at the locations shown on the drawings. The heat detector shall have a nominal fixed temperature alarm point rating of 135°F (57°C) and a rate of rise alarm point of 15°F(9°C) per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.

2.6.1.2.3 Low Profile Fixed Temperature

Provide low profile heat detectors as shown on the drawings. Detectors shall be rated for a maximum smooth ceiling rating of 2,500 sq. ft. (232 m²). The detector shall have a white finish and positive identification for the operation of the fixed temperature element. The detectors shall be rated at <135°F (57°C)><194°F (88°C)> fixed temperature.

2.6.1.3 Detector Bases

2.6.1.3.1 Detector Base - Audible

Provide audible standard detector mounting bases suitable for mounting

on either North American 1-gang, 3½ or 4 inch octagon box and 4 inch square box, or European BESA or 1-gang box. The audible base shall support all detector types and shall be capable of single or group operation. The audible base shall emit a steady or temporal alarm tone and be selectable for low or high output by moving a reversible jumper. The audible bases shall provide a reverberant room sound output of 82 dBA at 10ft (3m) and an average anechoic sound output of 98 dBA at 10 ft.(3m).

2.6.1.3.2 Detector Base - Relay

Provide relay standard detector mounting bases suitable for mounting on either North American 1-gang, 3½ or 4 inch octagon box and 4 inch square box, or European BESA or 1-gang box. The relay base shall support all detector types and have the following minimal requirements.

The relay shall be a bi-stable type and selectable for normally open or normally closed operation.

The position of the contact shall be supervised.

The relay shall automatically de-energize when a detector is removed.

The operation of the relay base shall be controlled by its respective detector processor. Detectors operating standalone mode shall operate the relay upon changing to alarm state. Relay bases not controlled by the detector microprocessor shall not be acceptable.

Form "C" Relay contacts shall have a minimum rating of 1 amp @ 30 Vdc and be listed for pilot duty.

Removal of the respective detector shall not affect communications with other detectors.

2.6.1.3.3 Detector Base - Standard

Provide standard detector mounting bases suitable for mounting on either North American 1-gang, 3½ or 4 inch octagon box and 4 inch square box, or European BESA or 1-gang box. The base shall, contain no electronics and support all series detector types.

2.6.1.4 Manual Stations

2.6.1.4.1 Explosionproof Manual Station

Provide explosion proof double action manual pull stations at the locations shown on the drawings. Pull stations shall be rated for operation in Class I, Div. 1 and 2, Groups C and D; Class II, Div. 1 and 2, Groups E, F and G; and Class III environments

2.6.1.4.2 Manual Station - Double Action Single Stage

Provide analog/addressable double action, single stage fire alarm stations at the locations shown on the drawings. The fire alarm station shall be of polycarbonate construction and incorporate an internal toggle switch. A locked test feature shall be provided. The station shall be finished in red with silver "PULL IN CASE OF FIRE" lettering. The manual station shall be suitable for mounting on North American 2 ½ (64mm) deep 1-gang boxes and 1 ½ (38mm) deep 4 square boxes with 1-gang covers.

2.6.1.4.3 Manual Station - Single Action Single Stage

Provide analog/addressable single action, single stage fire alarm stations at the locations shown on the drawings. The fire alarm station shall be of metal construction and incorporate an internal toggle switch. A locked test feature shall be provided. The station shall be finished in red with silver "PULL IN CASE OF FIRE" lettering. The manual station shall be suitable for mounting on North American 2 ½ (64mm) deep 1-gang boxes and 1 ½ (38mm) deep 4 square boxes with 1-gang covers.

2.6.1.4.4 Manual Station - Single Action Two Stage

Provide analog/addressable single action, two stage fire alarm stations at the locations shown on the drawings. The fire alarm station shall be of metal construction and incorporate an internal toggle switch for first stage alarm and key switch for second stage alarm. A locked test feature shall be provided. The station shall be finished in red with silver "PULL IN CASE OF FIRE" lettering. The manual station shall be suitable for mounting on North American 2 ½ (64mm) deep 1-gang boxes and 1 ½ (38mm) deep 4 square boxes with 1-gang covers.

2.6.2 Notification Appliances

2.6.2.1 Bells

2.6.2.1.1 Vibrating

Provide red vibrating fire alarm bells at the locations shown on the drawings. Bells shall be the under dome type, utilize a heavy-duty mechanism, and be polarized for supervised operation. Use 6" 83 dBA, 8" 84 dBA and/or 10" 86dBA diameter gongs as required. Provide weatherproof wall boxes for outdoor mounting. Provide flush wall mounted enclosures as required. Enclosure grills shall be finished with prime coat or stainless steel as required.

2.6.2.1.2 Vibrating Bell-Strobe

Provide combination vibrating bell/strobes at the locations shown on the drawings. Strobes shall provide synchronized flash. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 75cd, & 110cd devices.

2.6.2.1.3 Single Stroke

Provide 10" 79 dBA red single-stroke fire alarm bells at the locations shown on the drawings. Bells shall be the under-dome type with heavy-duty mechanisms, and polarized for supervised operation. Provide weatherproof wall boxes for outdoor mounting. Provide flush wall mounted enclosures as required. Enclosure grills shall be finished with prime coat or stainless steel as required.

2.6.2.1.4 Vibrating Bell-Explosionproof

Provide red explosionproof fire alarm vibrating bells with heavy-duty mechanisms at the locations shown on the drawings. The bells shall provide 83 dBA output and be polarized for supervised operation. Use 6", 8", and/or 10" gongs as required. The bells shall be UL listed for Class I Groups B, C, D; Class II Groups E, F, G; Class III Division 1 and 2 hazardous locations.

2.6.2.2 Chimes

2.6.2.2.1 Chime-Strobes

Provide electronic chime/strobes at the locations indicated on the drawings. Chime/strobes shall be UL listed for private mode operation. Chime/strobes shall emit a tone with a 91 dBA peak sound output level. It shall be possible to adjust the volume on individual chimes by use of a concealed volume control. Chime/strobes shall provide synchronized flash outputs. Strobe output shall be determined by its specific location and application from a family of 15cd, 30cd, & 110cd devices. The strobe shall have lens markings oriented for wall mounting. In and out screw terminals shall be provided for wiring.

2.6.2.2.2 Chimes

Provide electronic chimes at the locations shown on the drawings. Chimes shall be UL listed for private mode operation. Chimes shall emit a tone with a 91 dBA peak sound output level. It shall be possible to adjust the volume on individual chimes by use of a concealed volume control. In and out screw terminals shall be provided for wiring.

2.6.2.3 Horns

2.6.2.3.1 Low Profile Horns

Provide low profile wall mount horns at the locations shown on the drawings. The horn shall provide an 84 dBA sound output at 10 ft. when measured in reverberation room per UL-464. The horn shall have a selectable steady or synchronized temporal output. In and out screw terminals shall be provided for wiring. The horn shall mount in a North American 1-gang box.

2.6.2.3.2 Heavy Duty Horns

Provide heavy duty electronic horns at the locations shown on the drawings. Horns shall be selectable for high or low dBA output and steady or temporal output. At the high output setting, the horn shall provide a 85 dBA continuous sound output or a 82 dBA temporal sound output, when measured in reverberation room per UL-464. In and out screw terminals shall be provided for wiring. Weatherproof wall boxes shall be provided for outdoor applications.

2.6.2.3.3 Explosionproof - Class I

Provide surface mounted explosionproof fire alarm horns of the heavy duty electronic projector type at the locations shown on the drawings. The horns shall provide 109 dBA output, and be polarized for supervised operation. The horns shall be UL listed for Class I Division 1 and 2, Groups B, C, D hazardous locations.

2.6.2.3.4 Explosionproof - Class I II III

Provide surface mounted explosionproof fire alarm horns of the heavy duty electronic projector type at the locations shown on the drawings. The horns shall provide 109 dBA output, and be polarized for supervised operation. The horns shall be UL listed for Class I Division 1 and 2, Groups C, D; Class II Division 1 and 2, Groups E, F, G; Class III Division 1 and 2 hazardous locations.

2.6.2.4 Horn-Strobes

2.6.2.4.1 Low Profile Horn-Strobes

Provide low profile wall mount horn/strobes at the locations shown on the drawings. The horn/strobe shall provide an audible output of 84 dBA at

10 ft. when measured in reverberation room per UL-464. Strobes shall provide synchronized flash outputs. The strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd & 110cd devices. The horn shall have a selectable steady or synchronized temporal output. In and out screw terminals shall be provided for wiring. Low profile horn/strobes shall mount in a North American 1-gang box.

2.6.2.4.2 Heavy Duty Horn-Strobes

Provide horn/strobes at the locations shown on the drawings. Horns shall be selectable for high or low dBA output and steady or temporal output. At the high output setting, the horn shall provide a 85 dBA continuous sound output or a 82 dBA temporal sound output, when measured in reverberation room per UL-464. Strobes shall provide synchronized flash outputs. The strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd, & 110cd devices. In and out screw terminals shall be provided for wiring. Weatherproof wall boxes shall be provided for outdoor applications.

2.6.2.5 Speakers

2.6.2.5.1 Low Profile Speaker

Provide low profile wall mount speakers at the locations shown on the drawings. The low profile speaker shall not extend more than 1" (2.5cm) past the finished wall surface, and provide a switch selectable audible output of 2W (90dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (81dBA) at 10 ft. when measured in reverberation room per UL-464.

Wattage setting shall be visible with the cover installed. When the cover is installed, no mounting hardware shall be visible. In and out screw terminals shall be provided for all wiring. The low profile speaker shall mount in a North American 4" x 2 1/8" square electrical box, without trims or extension rings.

The low profile wall mount speaker shall be EST Genesis G4 series.

2.6.2.5.2 Speaker-Ceiling Mount-8in

Provide 8" ceiling mounted speakers at the locations shown on the drawings. In and out screw terminals shall be provided for wiring.

Speaker baffles shall be round or square steel with white finish as required. Provide square surface mount boxes with matching finish where required. Speakers shall provide 1/2w, 1w, 2w, and 4W power taps for use with 25V or 70V systems. At the 4 watt setting, the speaker shall provide a 94 dBA sound output a frequency of 1000 Hz. when measured in an anechoic chamber at 10 ft.

2.6.2.5.3 Speaker-Cone-4in

Provide 4" <white> <red> speakers at the locations shown on the drawings. Speakers shall have a 4" mylar cone, paper cones are not acceptable. The rear of the speakers shall be completely sealed protecting the cone during and after installation. In and out screw terminals shall be provided for wiring. Speakers shall provide 1/4w, 1/2w, 1w, and 2w power taps for use with 25V or 70V systems. At the 2 watt setting, the speaker shall provide a 90 dBA sound output over a frequency range of 400-4000 Hz. when measured in reverberation room per UL-1480.

2.6.2.5.4 Speaker-Reentrant Surface

Provide 4" surface re-entrant speakers at the locations shown on the drawings. Speakers shall provide 2w, 4w, 8w, and 15w power taps for use with 25V or 70V systems. The re-entrant speakers shall utilize a high efficiency compression drivers. Cone type drivers are not acceptable. At the 15 watt setting, the speaker shall provide a 102 dBA sound output over a frequency range of 400-4000 Hz. when measured in reverberation room per UL-1480. Weatherproof boxes shall be provided for outdoor mounting.

2.6.2.6 Speaker-Strobes

2.6.2.6.1 Low Profile Speaker-Strobe

Provide low profile wall mount speaker/strobes at the locations shown on the drawings. The low profile speaker/strobe shall not extend more than 1" (2.5cm) past the finished wall surface, and provide a switch selectable audible output of 2W (90dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (81dBA) at 10 ft. when measured in reverberation room per UL-464.

Strobes shall provide synchronized flash output, that shall be switch selectable for output values of 15cd, 30cd, 75cd & 110cd. Wattage and candela settings shall be visible with the cover installed. When the cover is installed, no mounting hardware shall be visible. In and out screw terminals shall be provided for all wiring. The low profile

speaker/strobes shall mount in a North American 4" x 2 1/8" square electrical box, without trims or extension rings.

The low profile wall mount speaker/strobes shall be EST Genesis G4 series.

2.6.2.6.2 Speaker-Strobe 4in

Provide 4" <white> <red> speakers/strobes at the locations shown on the drawings. Speakers shall have a 4" mylar cone, paper cones are not acceptable. The rear of the speakers shall be completely sealed protecting the cone during and after installation. In and out screw terminals shall be provided for wiring. Speakers shall provide 1/4w, 1/2w, 1w, and 2w power taps for use with 25V or 70V systems. At the 2 watt setting, the speaker shall provide a 87 dBA sound output over a frequency range of 400-4000 Hz. when measured in reverberation room per UL-1480. Strobes shall provide synchronized flash. Strobe output shall be determined as required by its specific location and application from a family of 15/75cd, 30cd, & 110cd devices.

2.6.2.6.3 Speaker-Strobe Ceiling 8in

Provide 8" ceiling mounted speaker/strobes at the locations shown on the drawings. In and out screw terminals shall be provided for wiring. Speaker baffles shall be round or square, steel with white finish as required. Provide square surface mount boxes with matching white finish as required. Speakers shall provide 1/2w, 1w, 2w, and 4W power taps for use with 25V or 70V systems. At the 4 watt setting, the speaker shall provide a 94 dBA sound output a frequency of 1000 Hz. when measured in an anechoic chamber at 10 ft. Strobes shall provide synchronized flash outputs. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 75cd, and 110cd devices.

2.6.2.6.4 Speaker-Strobe Re-entrant

Provide 4" <white> <red> <surface> <flush> re-entrant speaker/strobes at the locations shown on the drawings. Weatherproof boxes shall be provided for outdoor mounting. Speakers shall provide 2w, 4w, 8w, and 15w power taps for use with 25V or 70V systems. The re-entrant speakers shall utilize a high efficiency compression drivers. Cone type drivers are not acceptable. At the 15 watt setting, the speaker shall provide a 102 dBA sound output over a frequency range of 400-4000 Hz. when measured in reverberation room per UL-1480. Strobes shall

provide synchronized flash. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 75cd, & 110cd devices.

2.6.2.7 Strobes

2.6.2.7.1 Low Profile Strobes

Provide low profile wall mounted strobes at the locations shown on the drawings. In and out screw terminals shall be provided for wiring. Strobes shall provide synchronized flash outputs. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd, or 110cd devices. Low profile strobes shall mount in a North American 1-gang box.

2.6.2.7.2 Heavy Duty Strobes

Provide heavy duty strobes at the locations shown on the drawings. In and out screw terminals shall be provided for wiring. Strobes shall provide synchronized flash. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd, or 110cd devices. Strobes shall mount in a North American 1-gang box. For weatherproof application provide weatherproof wall boxes for mounting.

2.6.2.8 Multi-Tone Signals

2.6.2.8.1 Multi-Tone Signals Explosionproof Class I

Provide surface mounted explosionproof fire alarm multitone signals of the heavy-duty electronic projector type at the locations shown on the drawings. The signal shall be polarized for supervised operation. Select one of 19 tones as required. The signals shall be UL listed for Class I Division 1 and 2, Groups B, C, D hazardous locations.

2.6.2.8.2 Multi-Tone Signals-Explosionproof Class I II III

Provide surface mounted explosionproof fire alarm multitone signals of the heavy duty electronic projector type at the locations shown on the drawings. The signal shall be polarized for supervised operation. Select one of 19 tones as required. The sirens shall be UL listed for Class I Division 1 and 2, Groups C, D; Class II Division 1 and 2, Groups E, F, G; Class III Division 1 and 2 hazardous locations.

2.6.2.9 Sirens

2.6.2.9.1 Siren

Provide surface mounted fire alarm combination horn/sirens of the heavy duty electronic projector type at the locations shown on the drawings. The horn/siren shall be polarized for supervised operation. Select for horn or siren tone as required. Provide weatherproof wall boxes for outdoor mounting

2.6.2.9.2 Siren-Explosionproof Class I

Provide surface mounted explosionproof, fire alarm sirens of the heavy duty electronic projector type at the locations shown on the drawings. The sirens shall provide 105 dBA output, and be polarized for supervised operation. The sirens shall be UL listed for Class I Division 1 and 2, Groups B, C, D hazardous locations.

2.6.2.9.3 Siren-Explosionproof Class I II III

Provide surface mounted explosionproof, fire alarm sirens of the heavy duty electronic projector type at the locations shown on the drawings. The sirens shall provide 105 dBA output, and be polarized for supervised operation. The sirens shall be UL listed for Class I Division 1 and 2, Groups C, D; Class II Division 1 and 2, Groups E, F, G; Class III Division 1 and 2 hazardous locations.

2.6.3 Initiation & Control Modules

2.6.3.1 Intelligent Modules -- General

It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Modules requiring EPROM, PROM, ROM changes or DIP switch and/or jumper changes shall not be acceptable. The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment:

- Temperature: 32°F to 120°F (0°C to 49°C)

- Humidity: 0-93% RH, non-condensing

2.6.3.2 Control Relay Module

Provide intelligent control relay modules. The Control Relay Module shall provide one form "C" dry relay contact rated at 2 amps @ 24 Vdc to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems. The position of the relay contact shall be confirmed by the system firmware. The control relay module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.

2.6.3.3 Dual Input Module

Provide intelligent dual input modules. The Dual Input Module shall provide two (2) supervised Class B input circuits each capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The dual input module shall support the following circuit types:

- Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
- Normally-Open Alarm Delayed Latching (Waterflow Switches)
- Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
- Normally-Open Active Latching (Supervisory, Tamper Switches)

2.6.3.4 Dual Input Signal Module

Provide intelligent dual input signal modules. The Dual Input (Dual Riser Select) Signal Module shall provide a means to selectively connect one of two (2) signaling circuit power risers to one (1) supervised output circuit. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes. The dual input signal module shall support the following operation:

- Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A, 25 Vrms @ 50w or 70 Vrms @ 35w of Audio)

2.6.3.5 Isolator Module

Provide intelligent fault isolators modules. The Isolator Module shall be capable of isolating and removing a fault from a class A data circuit while allowing the remaining data loop to continue operating. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European

100mm square boxes.

2.6.3.6 Monitor Module

Provide intelligent monitor modules. The Monitor Module shall be factory set to support one (1) supervised Class B Normally-Open Active Non-Latching Monitor circuit. The monitor module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.

2.6.3.7 Single Input Module

Provide intelligent single input modules. The Single Input Module shall provide one (1) supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The single input module shall support the following circuit types:

- Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
- Normally-Open Alarm Delayed Latching (Waterflow Switches)
- Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
- Normally-Open Active Latching (Supervisory, Tamper Switches)

2.6.3.8 Single Input Signal Module

Provide intelligent single input signal modules. The Single Input (Single Riser Select) Signal Module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation. When selected as a telephone power selector, the module shall be capable of generating its own "ring tone". The module shall be suitable for mounting on North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes. The single input signal module shall support the following operations:

- Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A, 25Vrms @50w or 70 Vrms @ 35 Watts of Audio)
- Telephone Power Selector with Ring Tone (Fire Fighter's Telephone)

2.6.3.9 Suppression System Releasing Module

Provide addressable suppression system releasing interface module(s) at the locations shown on the drawings. The interface shall be suitable for preaction and deluge sprinkler systems and clean extinguishing agent release. The interface shall provide supervised Class B circuits required for solenoid

activation, manual release, system abort, and audible and visible notification of pending release. The interface shall provide all required release and abort timing functions. The interface shall be listed for use with solenoid releasing valves that has both ULI listing and FM approval. The solenoid release circuit shall be provided with a manual disconnect switch for system maintainance.

2.6.3.10 Universal Class AB Module

Provide intelligent class A/B modules. The Universal Class A/B Module shall be capable of a minimum of fifteen (15) distinct operations. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes. The universal class A/B module shall support the following circuit types:

- Two (2) supervised Class B Normally-Open Alarm Latching.
- Two (2) supervised Class B Normally-Open Alarm Delayed Latching.
- Two (2) supervised Class B Normally-Open Active Non-Latching.
- Two (2) supervised Class B Normally-Open Active Latching.
- One (1) form "C" dry relay contact rated at 2 amps @ 24 Vdc.
- One (1) supervised Class A Normally-Open Alarm Latching.
- One (1) supervised Class A Normally-Open Alarm Delayed Latching.
- One (1) supervised Class A Normally-Open Active Non-Latching.
- One (1) supervised Class A Normally-Open Active Latching.
- One (1) supervised Class A 2-wire Smoke Alarm Non-Verified.
- One (1) supervised Class B 2-wire Smoke Alarm Non-Verified.
- One (1) supervised Class A 2-wire Smoke Alarm Verified
- One (1) supervised Class B 2-wire Smoke Alarm Verified
- One (1) supervised Class A Signal Circuit, 24Vdc @ 2A.
- One (1) supervised Class B Signal Circuit, 24Vdc @ 2A.

2.6.3.11 Waterflow-Tamper Module

Provide intelligent waterflow/tamper modules. The Waterflow/Tamper Module shall be factory set to support two (2) supervised Class B input circuits. Channel A shall support a Normally-Open Alarm Delayed Latching Waterflow Switch circuit. Channel B shall support a Normally-Open Active Latching Tamper Switch. The waterflow/tamper module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.

2.6.4 Two-Way Audio

2.6.4.1 Telephone Handsets

Provide four (4) firefighter's telephone handsets for use with the firefighter's

telephone jack stations. The telephone handsets shall be red in color and have a 5 ft (1.3m) coiled cord.

2.6.4.2 Telephone Jacks

Provide stainless steel firefighter's telephone jack stations at the locations shown on the drawings. The jack station shall be clearly identified with the words "FIRE FIGHTER'S TELEPHONE" for use with portable fire fighter telephone handsets.

2.6.4.3 Warden Stations

Provide remote firefighter's telephone stations / warden stations at the locations shown on the drawings. The station shall consist of a red telephone handset housed within a locked break glass surface or flush mounted enclosures as shown on the drawings. The enclosure shall have a red finish, and shall be clearly marked "FIRE FIGHTERS TELEPHONE" in large letters for easy identification.

2.6.5 Security

2.6.5.1 Security Keypad

Provide a keypad display that contains a backlit, 8-line graphic LCD display at the locations specified on the drawings. The keypad shall provide tactile and audible user feedback telephone style 12-key keypad. The keypad shall illustrate all system events programmed for the display. The keypad shall have UL 864 (Fire), UL 294 (Access Control), UL 609 (Burglary), ULC S527(fire), and ULC S303 (Burglary) listings. The keypad display shall support menu driven applications, bi-lingual operation, bypass functions, arm/disarm security partitions, provides common controls for fire and stores 500 event transactions. A context sensitive help system shall be available to the user at any time.

2.6.5.2 Door Position Switch-Surface

Provide hermetically sealed surface mount door position switches at the doors indicated on the drawings. The contact shall be rated for 10 million cycles and shall not exceed a gap tolerance +/- 20%.

2.6.5.3 Door Position Switch-Concealed

Provide hermetically sealed concealed mount door position switches at the doors shown on the drawings. The contact shall be rated for 10 million cycles and shall not exceed a gap tolerance +/- 20%.

2.6.5.4 PIR Motion Detector

Provide a Passive Infrared (PIR) motion sensor as shown on the drawings. The Passive Infrared Motion Detector shall utilize adaptive signal processing with gliding focus mirror optics to analyze the size, speed and shape to determine the alarm threshold. The unit shall be configurable for up to seven different patterns, have a range of 34 feet and a 90-degree view. The unit shall wire directly to the same intelligent device loop as the intelligent fire detection and control where permitted by the authority having jurisdiction. The unit shall not require power from an external source. The unit addressing shall be electronic, jumpers or DIP switches shall not be considered as equivalent to electronic addressing. Removing the cover shall automatically activate the tamper switch and put the unit in the alignment mode. The unit shall be constructed of thermoplastic housing with integral (removable) cover and integral tamper switch.

2.6.6 Access Control

2.6.6.1 Card Reader-Proximity with Keypad

At the doors indicated on the plans, provide proximity type card readers that require the access control card be presented in close proximity from the card reader for the card to be read. Insertion of or swiping of the card through the card reader is not acceptable. The encoded data from the access card shall be sent to the card reader controller for processing. The card reader shall provide both audible and visual indication of a properly read card. The LED shall provide a different flash rate when a PIN number, visitor escort or second cardholder is required for access. The card reader shall incorporate an integral, weatherized keypad capable of transmitting personal identification numbers (PINs) to the card reader controller. The card reader output shall utilize the standard Wiegand output protocol and feature a re-present mode to prevent multiple reads from a single card presentation. The reader housing shall be constructed of polycarbonate material, suitable for mounting on a single gang electrical box. The card reader shall be fully weatherized and shall have an operating temperature of -22°F to 150°F (-30°C to 65°C) and shall have an operating range of 5 to 95% humidity, non-condensing.

2.6.6.2 Card Reader-Proximity-Mullion Mount

At the doors indicated on the plans, provide proximity type card readers that require only that the access control card be held in close proximity from the card reader for the card to be read. Insertion of or swiping of the card through the card reader is not acceptable. The encoded data from the access card shall be sent to the card reader controller for processing. The

card reader shall provide both audible and visual indication of a properly read card. The LED shall provide a different flash rate when a visitor escort or second cardholder is required for access. The card reader output shall utilize the standard Wiegand output protocol and feature a re-present mode to prevent multiple reads from a single card presentation. The reader housing shall be constructed of polycarbonate material, suitable for mounting on a doorframe or mullion. The card reader shall be fully weatherized and shall have an operating temperature of -22°F to 150°F (-30°C to 65°C) and shall have an operating range of 5 to 95% relative humidity, non-condensing.

2.6.6.3 Card Reader-Proximity-Standard

At the doors indicated on the plans, provide proximity type card readers that require that the access control card be held in close proximity from the card reader for the card to be read. Insertion of or swiping of the card through the card reader is not acceptable. The encoded data from the access card shall be sent to the card reader controller for processing. The card reader shall provide both audible and visual indication of a properly read card. The LED shall provide a different flash rate when a visitor escort or second cardholder is required for access. The card reader output shall utilize the standard Wiegand output protocol and feature a re-present mode to prevent multiple reads from a single card presentation. The reader housing shall be constructed of polycarbonate material, suitable for mounting on a single gang electrical box. The card reader shall be fully weatherized and shall have an operating temperature of -22°F to 150°F (-30°C to 65°C) and shall have an operating range of 5 to 95% relative humidity, non-condensing.

2.6.6.4 Card Reader Controller

Provide a card reader controller for each reader-equipped door, as required. The card reader controller shall have UL 864 (Fire), UL 294 (Access Control), UL 609 (Burglary), UL 1610 (Burglary), ULC S527 (fire), and ULC S303 (Burglary) listings. The card reader controller shall provide all the required intelligence to authorize or deny personnel access to the door. The card reader controller shall support a minimum of 8,000 card holders and shall be capable of supporting a maximum of 36,000 card holders. The card reader controller shall hold a minimum of 10,000 event history transactions and shall be capable of supporting a maximum of 20,000 event history transactions. The card reader controller shall support a minimum of one ingress reader/keypad, one egress reader/keypad, one locking device, one request to exit device, one door monitor input, one automatic door opener output and one optional sounder for local door annunciation. The card reader controller shall be capable of supporting standard reader and keypad formats. The card reader controller shall contain the database for all user

information including schedules and holidays. The database shall be contained in non-volatile memory. The card reader controller shall not require communication from the host computer to maintain door access functionality.

2.6.6.5 Door Strike

Provide a heavy duty electric strikes at the doors indicated on the plans. The strike shall contain an internal electrically operated solenoid mechanism having field selectable 12/24VDC operating voltage, and feature built in transient voltage suppression. The strike shall provide 20 lbs. resistance to side load pressure and be designed to accommodate cylindrical or non-deadbolt mortise locksets. The strike shall have a stainless steel housing, and provide horizontal adjustments. The strike shall be UL listed for A Label fire-rated openings and for burglary.

2.6.6.6 Lock-Magnetic-1650 Pound

Provide a surface mount magnetic locks at the doors indicated on the plans. The magnetic lock shall provide 1650 lbs. of direct holding force. The magnetic lock shall contain no moving parts to wear. The magnetic lock shall be UL listed as auxiliary locks for a 3 hour fire-rated opening and burglary resistance. Input voltage shall be 12 or 24VDC with built in voltage spike suppression.

2.6.6.7 Lock-Magnetic-650 Pound

Provide a surface or mortise mount magnetic locks at the doors indicated on the plans. The magnetic lock shall provide 650 lbs. of direct holding force. The magnetic lock shall contain no moving parts to wear. Input voltage shall be 12 or 24VDC with built in voltage spike suppression.

2.6.6.8 Request-To-Exit Pushbutton

Provide a heavy-duty push button switch to be used for egress at the doors shown on the plans. The push button shall be configured with either single pole double throw (SPDT) or double pole, double throw (DPDT) contact switches rated at .5 amps at 24V per switch. The heavy-duty switch shall be of standard size that will mount in a single gang box, surface or semi-flush.

2.6.6.9 Request-To-Exit-PIR

Provide a request to exit passive infrared (PIR) sensor at the doors indicated on the plans. The sensor shall be capable of being mounted on a wall, doorframe or the ceiling. The sensor shall contain dual relay outputs and have an adjustable range setting. Input voltage shall be either 12 or 24

VDC. The sensor shall be UL rated for the application.

2.7 Misc Components

2.7.1 Remote Diagnostic Software

The system shall have the ability to upload its status and sensitivity remotely using either a direct connection or dial-up modem to an owner supplied personal computer. The remote diagnostic software shall be capable of generating sensitivity and system status reports. The utility shall supply data for trend analysis reports using an owner supplied spreadsheet program. The Remote Diagnostic software shall be Windows® based and capable of receiving data from multiple installed life safety systems. The software shall be capable of generating off-line reports to minimize phone line charges. Use of the remote diagnostic software shall not compromise the functionality of the site-installed software.

PART 3 Execution

3.1 Installation

3.1.1 Installation Sequence

3.1.1.1 Install Sequence

<Edit sample below for each project>

Installation of the systems shall be conducted in stages and phased such that circuits and equipment are installed in the following order:

- Riser conduits, AC power conduits and control cabinets.
- Fire command center, remote control panel(s), control component(s), annunciator(s), remote CRT terminal(s), and printer(s). Provide temporary mounting of fire command center in <location.>
- Conduits and wiring for complete notification circuits and appliance installation throughout facility.
- Pre-test the audible and visual notification appliance circuits.
- Install all new detection devices.
- Terminations between field devices and the associated control equipment.
- The detection system shall be switched over and end of each day the system shall be operational. At no time will the system be placed out of service over night.
- Complete the interface to the building automation system.
- Complete contractor pre-test of system.
- Complete system testing.

3.1.2 General

All equipment shall be attached to walls and ceiling/floor assemblies and shall be mounted firmly in place. Detectors shall not be supported solely by suspended ceilings. Fasteners and supports shall be sized to support the required load.

3.1.3 Conductors

The requirement of this section apply to all system conductors, including all signaling line, initiating device, notification appliance, auxiliary function, remote signaling, AC and DC power and grounding/shield drain circuits, and any other wiring installed by the Contractor pursuant to the requirements of these Specifications.

All circuits shall be rated power limited in accordance with NEC Article 760.

<Installed in conduit or enclosed raceway.>

<The existing cable/wiring may be re-used providing they meet the manufacturer's published wiring requirements.>

All new system conductors shall be of the type(s) specified herein.

All initiating circuit, signaling line circuit, AC power conductors, shield drain conductors and grounding conductors, shall be solid copper, stranded or bunch tinned (bonded) stranded copper.

All signaling line circuits, including all addressable initiating device circuits shall be 18 AWG minimum multi-conductor jacketed twisted cable or twisted shielded or as per manufacturer's requirements.

All non-addressable initiating device circuits, 24 VDC auxiliary function circuits shall be 18 AWG minimum or per manufacturer's requirements.

All notification appliance circuit conductors shall be solid copper or bunch tinned (bonded) stranded copper. Where stranded conductors are utilized, a maximum of 7 strands shall be permitted for No. 16 and No. 18 conductors, and a maximum of 19 strands shall be permitted for No. 14 and larger conductors.

All audible notification appliance circuits shall be 14 AWG minimum twisted pairs or twisted pairs shielded or per manufacturer's requirements.

All visual notification appliance circuits shall be 14 AWG minimum THHN or twisted pairs or twisted shielded pairs or per manufacturer's requirements.

3.1.4 Conductors and Raceway

Except as otherwise required by <

> Code and/or these Specifications, the installation of all system circuits shall conform to the requirements of Article 760 and raceway installation to the applicable sections of Chapter 3 of NFPA 70 - 1996, National Electrical Code. Fire alarm circuit wiring shall include all circuits described in Section 760-1 including Fine Print Note No. 1 (FPN No. 1), and as defined by the manufacturer's UL listing.

The entire system shall be installed in a skillful manner in accordance with approved manufacturer's installation manuals, shop drawings and wiring diagrams. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation. All wiring shall be of the type required by the NEC and approved by local authorities having jurisdiction for the purpose.

Any shorts, opens, or grounds found on new or existing wiring shall be corrected prior to the connection of these wires to any panel component or field device.

The contractor shall neatly tie-wrap all field-wiring conductors in the gutter spaces of the control panels and secure the wiring away from all circuit boards and control equipment components. All field-wiring circuits shall be neatly and legibly labeled in the control panel. No wiring except home runs from life safety system circuits and system power supply circuits shall be permitted in the control panel enclosures. No wiring splices shall be permitted in a control panel enclosure.

All penetration of floor slabs and firewalls shall be fire stopped in accordance with all local fire codes.

3.1.5 Open Cable

Power-limited cable in accordance with NEC 70, where used, not installed in UL listed metal conduit or raceway shall be mechanically protected by building construction features:

Installation shall be in areas not subjected to mechanical injury.

All circuits shall be supported by the building structure. Cable shall be attached by straps to the building structure at intervals not greater than 10 feet. Wiring installed above drop ceilings, cable shall not be laid on ceiling tiles. Cable shall not be fastened in a manner that puts tension on the cable.

Cable type shall be FPLP, FPLR or FPL, or permitted substitutions, selected for

the installation application as required by NEC 70, Section 760-61.

All cable that is not enclosed by conduit shall be supported and anchored with nylon straps or clamps. The use of staples is prohibited.

3.1.6 Conduit Raceway

All systems and system components listed to UL864 Control Units for Fire Protective Signaling Systems maybe installed within a common conduit raceway system, in accordance with the manufacture's recommendations. System(s) or system components not listed to the UL864 standard shall utilize a separate conduit raceway system for each of the sub-systems.

The requirements of this section apply to all system conduits, raceways, electrical enclosures, junction boxes, pull boxes and device back boxes.

All system conduits shall be of the sizes and types specified.

All system conduits shall be EMT, 3/4 -inch minimum, except for flexible metallic conduit used for whips to devices only, maximum length 6 feet, 3/4-inch diameter, minimum.

All system conduits, which are installed in areas, which may be subject to physical damage or weather, shall be IMC or rigid steel, 3/4 -inch minimum.

Conduits shall be sized according to the conductors contained therein. Cross sectional area percentage fill for system conduits shall not exceed 40%.

Provide all new conduit raceway and conduit riser.

<Existing conduit raceway system may be re-used where possible.>

All fire alarm conduit systems shall be routed and installed to minimize the potential for physical, mechanical or by fire damage, and so as not to interfere with existing building systems, facilities or equipment, and to facilitate service and minimize maintenance.

All conduits, except flexible conduit whips to devices, shall be solidly attached to building structural members, ceiling slabs or permanent walls. Conduits shall not be attached to existing conduit, duct work, cable trays, other ceiling equipment, drop ceiling hangers/grids or partition walls, except where necessary to connect to initiating, notification, or auxiliary function devices.

All system conduits, junction boxes, pull boxes, terminal cabinets, electrical enclosures and device back boxes shall be readily accessible for inspection,

testing, service and maintenance.

3.2 Field Quality Control

3.2.1 Test & Inspection

All intelligent analog addressable devices shall be tested for current address, sensitivity, and user defined message.

All wiring shall be tested for continuity, shorts, and grounds before the system is activated.

All test equipment, instruments, tools and labor required to conduct the tests shall be made available by the installing contractor.

The system including all its sequence of operations shall be demonstrated to the Owner, his representative, and the local fire inspector. In the event the system does not operate properly, the test shall be terminated. Corrections shall be made and the testing procedure shall be repeated until it is acceptable to the Owner, his representatives and the fire inspector.

At the final test and inspection, a factory trained representative of the system manufacturer shall demonstrate that the system functions properly in accordance with these specifications. The representative shall provide technical supervision, and participate during all of the testing for the system.

All fire alarm testing shall be in accordance with National Fire Alarm Code, NFPA 72 - 1999, Chapter 7.

A letter from the Contractor certifying that the system is installed entirely in accordance with the system manufacturer's recommendations and within the limitations of the required listings and approvals, that all system hardware and software has been visually inspected and functionally tested by a manufacturer's certified representative, and that the system is in proper working order.